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Market Perspectives on New Technologies: The Case of Tesla

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"Now the meaning of the saying becomes clear: buy at a price below intrinsic value, and sell at a higher price. Of course, to do that, you'd better have a good idea what intrinsic value is. For me, an accurate estimate of value is the indispensable starting point."

The Most Important Thing
Howard Marks (2011)

Acknowledgments

This paper is one of the biggest achievements of my academic life. It is the culmination of persevering, determination, hard work and dedication . While my journey as an academic is coming to an end, I have to be grateful for all the opportunities I was given and for the continuous support of my family and friends.

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Sumário Executivo

A Tesla é, sem dúvida, uma das empresas mais cobiçadas do mercado e uma das empresas mais valiosas do mundo. A posição que alcançaram no mercado de veículos elétricos e de energia solar (no qual estão a estabelecer-se como empresa pioneira), reflete uma cultura de inovação alicerçada numa estratégia única que tem como principal objetivo o destaque de entre as demais.

A abordagem ao cliente, a inovação e a perceção da marca no mercado, são fatores que contribuem para que a empresa esteja na vanguarda. A implementação de uma estratégia única, complementada com um grande investimento para aumento da capacidade produtiva, tem como objetivo principal aumentar a cota de mercado e beneficiar de economias de escala, para que seja possível haver uma redução dos preços, passando de uma estratégia inicial de marca premium, para uma marca mais acessível aos consumidores.

Com um aumento esperado na capacidade de produção, com a integração vertical alcançada nos últimos anos e com o lançamento de novos modelos que vão desde modelos desportivos a modelos de transporte de mercadorias, a empresa tem a estratégia de posicionar-se no mercado dos veículos elétricos com o intuito de absorver um maior número de clientes e de criar valor acrescentado para os seus shareholders. Ainda assim, a Tesla tem um longo caminho a percorrer para que se possa tornar uma empresa estável. A cotação alcançada em bolsa não é inteiramente justificada pelos resultados anuais, mas sim também pela especulação no mercado de tecnologia. Analisando cuidadamente o setor podemos constatar que existe um grande número de competidores no mercado que vêm trazer uma ameaça ao modelo de negócio da Tesla. Ainda que o futuro da Tesla possa vir a ser prometedor e que haja a perspetiva de poder estar ao mesmo nível das grandes marcas com o desenvolvimento contínuo do setor e uma transição de paradigma da atualidade para um mundo mais sustentável, com base nos resultados alcançados neste trabalho, é desaconselhado o investimento em ações da Tesla.

Para que o investidor/leitor possa entender os principais fatores que motivaram esta conclusão, deve ser lidos com mais detalhe os resultados alcançados.

Abstract

Markets these days are increasingly difficult to analyze. This conclusion is adjacent to the fact that there is an increase in the number of complex variables that affect a company. All these changes are contributing to a lower understanding of the market and it is not possible to estimate with much certainty, the future of a company and of the market itself. One of the biggest revelations of our century is the technology markets. The big question that arises is how technology markets will evolve in such a versatile and exhausting environment and which companies will thrive in such a complex environment.

In light of this question, we set out to analyze an emerging company in the technology sector, in order to give the public an overview of the technology market and an insightful contribution to investment decision making in the sector.

The chosen entity was Tesla. This is a company that had a tremendous growth in recent years, making it one of the most valuable companies in the world. This paper seeks to explain the history of this company and its position in the market, helping in the decision-making process for a more conscious investment. Based on the results achieved, we have grounds to issue an opinion on whether the company is, in fact, a good long-term investment or whether the valuation of the company's shares is being distorted by speculation, resulting from the fact that Tesla is recognized as a new trend.

Table of Contents

List of Tables:

List of Abbreviations:

EV - Electric Vehicle
BEV- Battery Electric Vehicle
PHEV's - Plug-in Hybrid Electric Vehicles
HEV's - Hybrid Electric Vehicles
rf - risk-free rate
rm - market risk
WACC - Weighted Average Cost of Capital
TV - Terminal Value
g - growth rate
CF - Cash-Flow
r - discount rate
$E(r_m)$ - expected return of the market

1. Introduction

The core definition of valuation gives us the perception that there is only one fair value that we can estimate to understand the real position of a company in the market.

However, valuation is not an exact science, it is a tool susceptible to be changed and adapted to the specificities of a company, resulting in a more advantageous outcome if the managers have the combination of valuation knowledge and skill to use valuation to their own advantage (Bancel & Mittoo, 2014). It is important to understand that despite the fact that every investor can have access to an estimate of the fair value of a company, there is also another factor that have a direct impact in how companies are perceived by the market - future expectation (Hurd & Rohwedder, 2012).

Tesla is a great example of such situation. The giant tech and car manufacturer's stocks are exceling within the market with a growth rate far beyond reasonable, taken into account the amount of revenues the company generates. The degree of uncertainty associated with the stocks, according to innumerous market platforms, is very high and showing no stops of slowing down. But, how is Tesla, Inc, thriving in such a harsh market environment that was tremendously and negatively affected by the current world pandemic? The answer is complex, there is a combination of factors that created the ideal situation for tech companies to grow far beyond reasonable levels. Linkages between strategy and finance made Tesla a unique player in the market. The aggressive strategy of market penetration associated with the market position of the brand that is seen as premium (for now), the product line, the technology development, the vehicle design, are some of the factors that makes Tesla stocks a trend. Tesla is not bringing something new to the market when it comes to vehicles, electric cars were already a reality way before Tesla.

Tesla is now listed as the most valuable car manufacturer (as of 2020) and one of the most promising tech companies in the world, but it wasn't always like this. Contrary to big car companies that have an extent history, Tesla, Inc. only gained terrain in the market in last years.

Founded in 2003, Tesla wasn't always a successful company. In January 2008 it was on the verge of filing for bankruptcy. However, it survived due to the fact that NHTSA, an agency dependent of the US government, contributed with $43 million, an unjustified investment considering that since Tesla creation the company has registered nothing but losses. This was not an isolated problem. In August 2008 Tesla failed to raise

$100 million it needed to survive, and the consequences translated in the dismissal of a quarter of the employees and the closure of Michigan engineering office. So how did Tesla overcome this situation and got to a strength position within the market? The company suffered an enormous shift in strategy, it attracted several partners such as Toyota, Daimler AG, US department of Energ, and a lot more private capital funds. The investment made allowed Tesla to research battery systems, propulsion for electric vehicles and vehicle projects.

This is a case of perseverance from one of its investors, Elon Musk, that dedicated his time in developing Tesla, Inc., by not giving up on a business model that would eventually beginning to show results. And so it was, Tesla went public on 29th June, 2010, with a share price of $17.

Since then, it reached the mark of $901 per share on February 21, 2020, and it is currently one of the most preeminent companies in the world.

All the past history of the company is necessary to understand why this work is relevant, understanding how a business can be so coveted by the market and what was the strategy behind this situation. This topic matters to the community and, most of all, to investors. Understanding the characteristics of businesses that can thrive like this is essential to the area of capital investment.

Through the results shown in this work, answers will be given to the main interrogations regarding Tesla: i) Why is Tesla able to compete in a market dominated by legacy brands such as Mercedes, BMW, Toyota, Volkswagen and what is their strategy? ii) Is Tesla finances justifying their stock performance? iii)Is Tesla worth investing in?

That's what this thesis tries to find out.

2. Literature Review

2.1. Valuation

This segment will be characterized by a review of the principal authors of the topic of Corporate Valuation, as well as the presentation of the most used valuation methods and which one has the highest rate of acceptance.

First of all, it is important to understand what is valuation. According to Damodaran (2006), valuation is the core element of finance. It is through valuation that we better understand how to make the proper adjustments to increase company value by changing its investment, financing, and dividend decision. Every theory of business valuation is based on a model. Such a model possesses characteristics (Kruschwitz & Loffler, 2006) that lead to different approaches by managers when doing business valuation.

There are four main methodologies that are used in a company valuation, each one gives us a forecast of the eventual value of a company. The first method is the Discounted cash flow (DCF) valuation, followed by relative valuation, liquidation and accounting valuation and contingent claim valuation.

2.1.1. Discounted Cash Flow Valuation

In accordance with a survey conducted by Bancel & Mittoo (2014) that interviewed 356 experts in valuation across 10 European countries, DCF method is the most used method to estimate the fair value of an asset. This methodology states that the value of an asset is not what the market perceives it to be, but it is intrinsically connected to the expected cash flows of that asset. Put simply, assets with high and predictable cash flows should have higher values than assets with low and volatile cash flows (Damodaran, 2006). To compute a company value, we estimate the future cash flows and then discount them at a discount rate that has in consideration the riskiness of the cash flows.

The different cash flow discounting-based methods start with the following expression (Fernandez, 2002a)

$$V = \frac{CF1}{1+r} + \frac{CF2}{(1+r)^2} + \cdots + \frac{CFn + VRn}{(1+r)^n} \qquad RVn = \frac{CFn \times (1+g)}{r-g} \qquad (1)$$

CFi = cash flow generated by the company in the period I; Vn = residual value of the company in the year n; r = appropriate discount rate for the cash flows' risk; g = expected growth rate of the cash flows after the explicit period.

Damodaran (2010) comments that there are two ways in which we can approach discounted cash flow valuation, the first being valuing an entire business with both assets-in-place and growing assets, which is called firm valuation. The second approach is simply valuing the equity stake in the business, being called equity valuation.

Firm Valuation or FCFF approach obtains the value of a company by discounting its expected cash flows, for example, the residual cash flows after meeting all operating expenses, reinvestment needs and taxes, but prior to any payments to either debt or equity holders, at the weighted average cost of capital (WACC), which is the cost of the different financing used by the company, weighted by their market value proportions (Damodaran, 2002). The reason that lies with not using financial leverage is that using net debt issues or payments result in much more difficulties to estimate cash flows since the financial leverage is changing over time (Damodaran, 2015).

$$FCFF = \text{EBIT}(1 - \text{t}) + \text{Amortizations} - \text{Capital invested in Capex} - Investment\ in\ Working\ Capital \quad (2)$$

The *Firm Valuation approach* uses the above formula to calculate the company cash flows and afterwards we discount them at the WACC rate in order to assess the fair value of the company in accordance with the following metholodogy:

$$PV = \frac{FCFF1}{1 + WACC} + \frac{FCFF2}{(1 + WACC)^2} + \cdots + \frac{FCFFn + TVn}{(1 + WACC)^n} \quad (3)$$

$$TVn = \frac{FCFFn \times (1 + g)}{(WACC - g)}$$

FCFFn = Cash flow generated by the company in the period n; TVn = Terminal value of the company in the year n; WACC = Appropriate discount rate for the cash flows risk; g = Expected growth rate of the cash flows after the explicit period.

Fernandez (2007) explains that the WACC is used to value a company as a whole, since it considers its complete financial structure and the weight of the return to debt and return to equity in the proportion to which they finance the firm.

The WACC discount rate is calculated as follows:

$$WACC = \frac{E \times Re + D \times Rd \times (1 - T)}{E + D} \quad (4)$$

E = Market value of equity; D = Market Value of debt; Re = Required return of equity, reflects the risk of equity; Rd = Required return of debt; T = Tax rate

Vernimmen et al. (2005) notes that it is important to calculate an accurate cost of capital since this rate is the minimum rate of return required by the company fund providers such as shareholders and lenders. Even though this is the most commonly used discount rate, there are some limitations regarding WACC. As stated above, this method takes into consideration the weight of the return to equity and return to debt in the proportion of which they finance the firm. The assumption of "No change in Capital Structure" needs to be met. According to Harris & Pringle (1985), the big limitations of WACC is that its only fit for projects that have average risk for the firm, that is, projects having the same risk of the existing projects of the portfolio and also the same amount of equity capital and debt capital used.

Adiningrum and Soekarno (2015) explains that to compute the WACC we need to calculate the cost of equity and the cost of debt of the mentioned company. In order to achieve this, we will use the most common model used to adjust the cost of equity for differences in risk, the CAPM. The referred model suggests that the expected rate of return of an asset is equal to the risk-free rate plus the asset's beta times the market risk premium.

$$E(Ri) = rf + \beta i\{E(rm) - rf\} \quad (5)$$

Where: $E(R_i)$= expected return of asset I; rf = risk-free rate; β_i = asset i's sensitivity to the market; $E(r_m)$ = expected return of the market

In this model, the rf and E(rm) are equal to all market companies. The beta differs since it can be seen as: *"a stock's incremental risk to a diversified investor, where risk is defined as the extent to which the stock moves up and down in conjunction with the aggregate stock market* " p.293 (Koller, et al. 2010). To calculate the cost of debt, there is no general formula, each case must be considered according to the type of debts in question and if there is any probability of default. Generally, the cost of debt can be calculated by a company determining the total amount of interests it is paying on each of its debts. Then it divides the total amount of interests by the total amount of debt contracted by the company (Cooper & Davydenko, 2001).

In Firm Valuation there is also a second alternative to calculate the present values of the company cash flows. While in the first section of firm valuation it is used the WACC discount, in this second section we will mention an other alternative, the APV approach to calculate the cash flows. On this approach the goal is to have a more accurate estimation of the cash flows by valuating the company without debt and then adding the financial effect of borrowing. Booth (2002) comments that when changing financial risk WACC needs to be adjusted to the new cost of debt although, if we use the APV approach, this problem is solved. It is an interesting framework simply beacause allows analysts to undesrstand what creates value since it separates the debt analysis from the equity analysis. The author also explains that the primary benefit of borrowing capital is the tax benefit generated by the interests paid by the company. In this approach, it is not assumed that the debt ratio stays the same for all components, in fact, there is a flexibility to keep the value of the debt changing according to the risk.

Equity valuation or *ECF approach*, measures the fair value of the equity of a leveraged company by discounting the cash flow to equity at a rate that reflects the risk of the equity (Oded & Michel, 2007). By virtue of this fact, the first step of the model lies with the calculation of the cash flows to equity by subtracting from the FCFF the interests and principal payments made to the debt holders and adding the new debt provided (Fernandez, 2002b):

$$ECF = FCF - \big(interest\ payments \times (1-t)\big) - principal\ repayments + new\ debt \quad (6)$$

The second step is to calculate the equity of a company by discounting the equity cash flows using the appropriate rate that reflects the equity risk:

$$PV = \frac{FCFE1}{1+Re} + \frac{FCFE2}{(1+Re)^2} + \cdots + \frac{FCFEn + TVn}{(1+Re)^n} \quad (7) \quad TVn = \frac{FCFEn \times (1+g)}{(Re-g)} \quad (8)$$

FCFEn = Expected equity cashflows in the period n; TVn = Terminal value of the company in the year n; Re = Cost of equity; g = Expected growth rate of the cash flows after the explicit period.

2.1.2. Liquidation and Accounting Valuation

According to Fernandez (2007), in this method the value of the company is essentialy demonstrated in the balance sheet. The problem is that it values a company from a stactical point of view and therefore a problem may arise since it does not consider the company future evolution or the value of money in time. There are several methodologies used in this approach. The Book Value, Adjusted Book Value, Substantial Value and Liquidation Value, which is the most common one. Regarding this last methodology, the liquidation value simply states the value of the company if it is liquidated, that is, if all assets are sold and its debts are paid off and also subtracting the liquidation costs such as contract termination expenses, legal expenses and other liquidation expenses. The author also makes it clear that this approach is used only in very specific situations such as: the case where a company is bought for the only purpose of liquidation in a later date. The liquidation value is always the minimum value of a company since it does not taje into account the future profits of the company.

2.1.3. Relative Valuation

This framework does not use cash flows or discount rates to acknowledge the value of a company, instead it values assets based upon how equivalent assets are currently priced in the market. While this method is easy and intuitive, it can be misapplied. To equate the values of comparable companies in the market, there is a need to standardize the values. For this purpose, there are several multiples used: values relative to the earnings that companies generate (PER), to the book value (PBV), to the revenues or to measures that are specific to companies in a sector (Damodaran, 2002).

The Price Earnings Ratio (P/E Ratio) is the relationship between a company's stock price and earnings per share (EPS). It is a popular ratio that gives investors a better sense of the value of the company. The P/E ratio shows the expectations of the market, and it is a ratio that implies the relation between the price you must pay per share and the current earnings per share. Using this ratio, a multiple is estimated by analyzing the assets cash flows it generates or will generate (Corporate Finance Institute, 2015).

The PBV is the ratio that correlates equity at market value with equity at book value. It is a measure of shareholders equity on a balance sheet and its relation with what the market is willing to pay for that equity. It can be given by the simple equation of PBV=Market value of Equity/Book value of Equity (Damodaran, 2002). In this approach,

the value of an asset or company is calculated by multiplying the book value of an asset or company, times the multiple that was estimated through the method that best fit to evaluate the asset in question.

Fernandez (2001) emphasizes that *relative valuation* based on the multiples have a broad disperson which makes the valuation highly debatable and presents the next figure.

Figure 1

Relative Valuation: Multiples

P/E, PER	Price earnings ratio
P/CE	Price to cash earnings
P/S	Price to sales
P/LFCF	Price to levered free cash flow
P/BV	Price to book value
P/AV	Price to asset value
P/Customer	Price to customer
P/units	Price to units

P/output	Price to output
EV/EBITDA	Enterprise value to EBITDA
EV/S	Enterprise value to sales
EV/FCF	Enterprise value to unlevered free cash flow
EV/BV	Enterprise value to book value
PEG	Price earnings (PER) to growth
EV/EG	Enterprise value to EBITDA growth

2.1.4. Contingent Claim Valuation

Damodaran (2006) claims that the last approach, *Contingent Claim Valuation*, uses option pricing models to measure the value of assets that share the option characteristics. The traditional models do not account for the company flexibility to adapt and revise decisions in response to market unexpected events. Nevertheless, the outside world is characterized by change and being so, companies can adapt their circumstances in order to capitalize on new opportunities. This flexibility is like financial options, where the owner has the right, but not the obligation to buy or sell the financial instrument (Banjan, 2014). This model values assets through the understanding of the assets cash flows, contingent to the occurrence of an event. That is, an asset's value varies according to an event that occurs and if it has or not a direct influence on the price and cash flows generated by the asset. The problem that arises with this model is that not every asset can be valued by a contingent claim. Banjan (2014) gives the example of R&D projects since they can't be traded and explains that getting a current value for an asset like this can be a dauting task

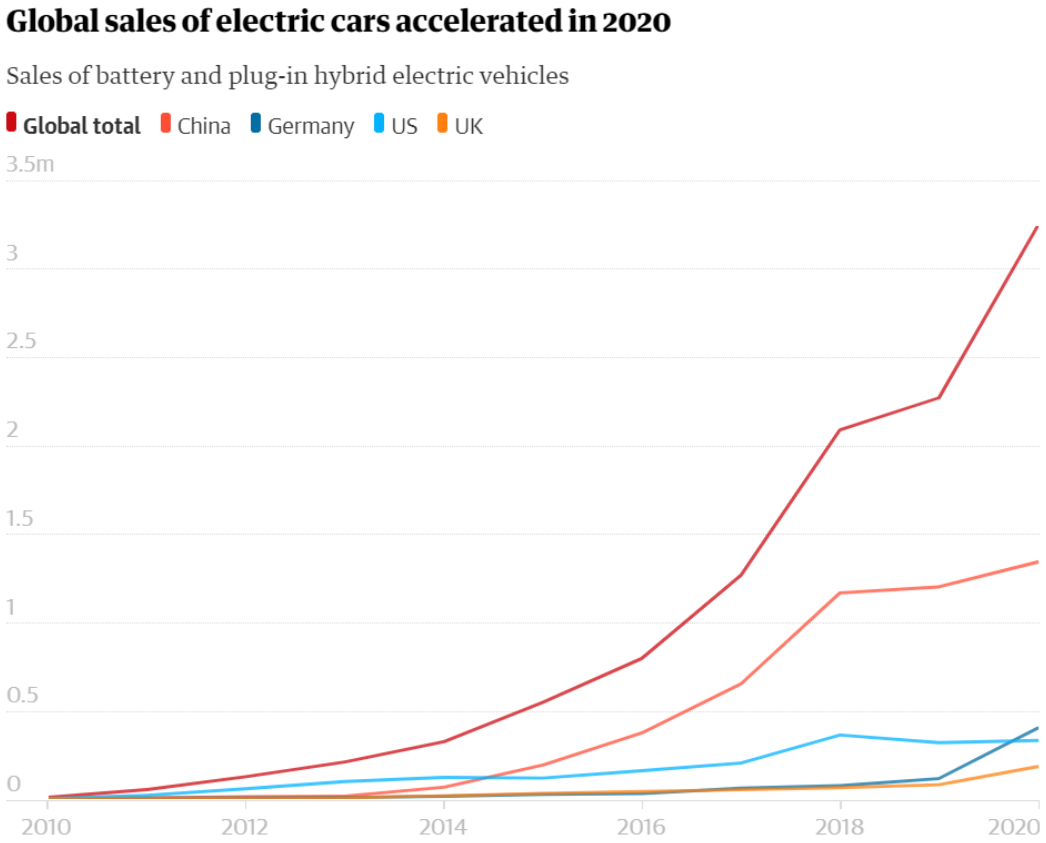
3. The Electric Vehicle Industry

3.1. General Overview

To proper analyze Tesla and how the company is placed in the market of electric car companies it is of utmost importance to understand the current pace of the electric vehicle industry, the environment in which Tesla is competing and the macroeconomic factors that influence the overall value of the companies operating in the sector.

Figure 2

Evolution of Global sales of electric cars (millions of cars)



Source: The Guardian graphic (www.ev-volumes.com)

The global EV industry has experienced a tremendous growth in the last 10 years and there is no sign of slowing down. With sustainability as one of the main trends in today's markets, companies and consumers are switching their focus from fossil fuel powered cars to more sustainable alternatives such as battery electric vehicles and plug-in electric vehicles. The significant factors contributing to this paradigm transition is the need to lower the carbon emissions, the regulatory benefits and the technologic advancement of powertrain components and the advancing consumer behavior.

With an estimation of 70 million cars (both fossil fueled and electric powered) sold annually worldwide by all companies combined (Statista, 2021). Latest data show that only in 2020, the number of electric cars sold rose by 43% from more than 2 200 000 units to 3 250 000 units. With the transition from fossil fueled cars to electric cars in place, there is still a big market share available to be conquered by electric car companies..

Due to the fact that Tesla successfully shaped its business to understand and respond to market needs of electric vehicles, it has a serious market position to absorb a considerable market share in the following years. Tesla manufacturers and sells vehicles that possess a different technology from the traditional automotive sector. The traditional sector is entirely composed by combustion motor cars. The segment in which tesla competes is the EV's sector and it is divided in three different segments:

- BEV's : Battery Electric Vehicles, are vehicles powered solely by an electric battery, with no gas engine parts. Most BEVs are capable of fast charging and L2 charging. Zero emissions..

- PHEV's : Plug-in Hybrid Electric Vehicles, have both a combustion engine and electric motor to drive the car. Like regular hybrids, they can recharge their battery through regenerative braking. They differ from regular hybrids by having a much larger battery, and being able to plug into the grid to recharge.

- HEV's : Hybrid Electric Vehicles, have both a gas-powered engine and an electric motor to drive the car. All energy for the battery is gained through regenerative braking, which recoups otherwise lost energy in braking to assist the gasoline engine during acceleration.

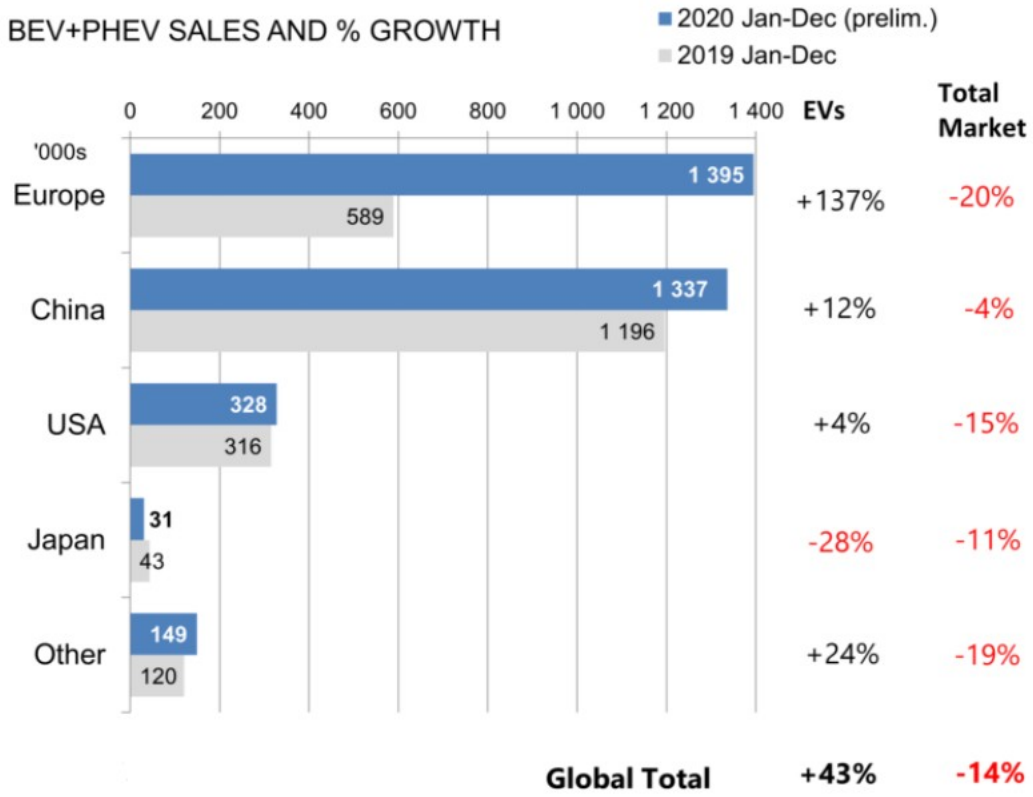
Tesla has its focus on the BEV's market which are Battery Electric Vehicles, also called BEVs and more frequently called EVs. These are fully electric vehicles with rechargeable batteries and no gasoline engine. All energy to run the vehicle comes from the battery pack which is recharged from the grid. BEVs are zero emissions vehicles, as they do not generate any harmful tailpipe emissions or air pollution hazards caused by traditional gasoline-powered vehicles.

There are four main markets that dominate global EV's sales – China, Europe, USA and Japan. China is by far the largest consumer market when compared to Europe, USA

and Japan. The reach of their internal market covers more than a billion people (more than Europe, USA and Japan combined). Surprisingly, as of 2020, Europe has the biggest share of bought electric vehicles, follow by China, USA and Japan.

Figure 3

Cars sold per continent in 2019 and 2020. Source - www.ev-volumes.com

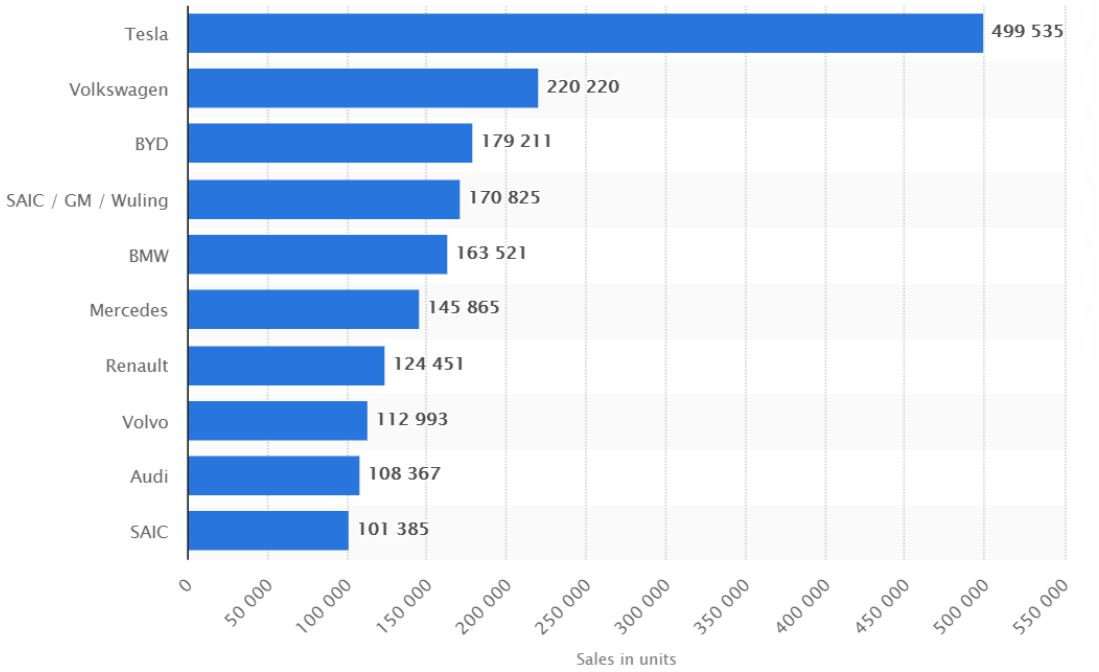


According to Boston, 2021, governments incentives and subsidies are the core reason for Europe's highest market share. The volatility associated with the continuing growing is only linked with this continuing support. Boston, 2021, also includes a citation by Arndt Ellinghorst that predicts that there is a high probability of a 30% to 40% collapse on the acquisition of EV's by Europeans when governments no longer make incentives available, at least for one or two quarters of a year, provoked by the effect of lack price increase.

Tesla is currently the highest selling brand on BEV's market, as of 2020, surpassing the legacy car companies that are transitioning from the traditional vehicle manufacturer to EV's manufacturer such as Volkswagen, BMW, Mercedes, Renault, Volvo and Audi.

Figure 4

Estimated Plug-in electric vehicles sales worldwide, by automaker 2020. Source: www.statista.com



Strategy, investments, and market positioning are the main reasons for a relative new company surpassing long establishing car brands on the selling of new EV's.

Furthermore, forecasts on electric vehicles sales till 2030 are changing the way companies perceive their business strategy, which should promote a swift transition from the traditional car sector to the EV's sector. According to Deloitte, in 2030 there will be 21 million units sold (of which 70% BEV's).

The potential of the EV's sector has attracted an influx of new entrants, mainly from China. The majority of component makers also announced their interest in the EV's market and so, the number of manufacturers is unsustainable. Tesla understands the hard context of establishing themselves as one of the most trusted EV's car brands and along the year has been building a reputation known worldwide as one of the most promising companies in the world.

3.2. Macroeconomic factors influencing the EV's sector

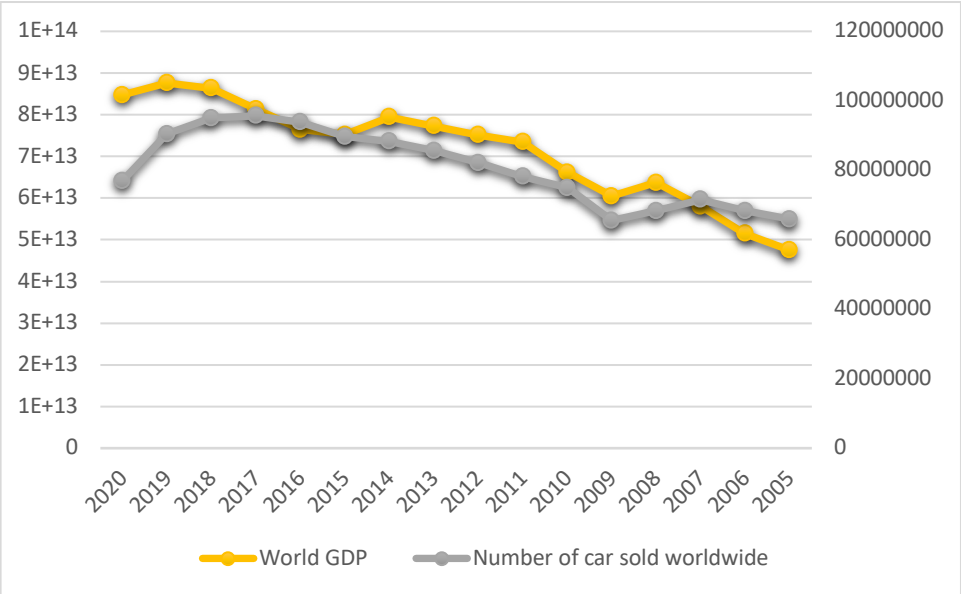
With the purpose of understanding how will the global EV's industry perform in the next years it is important to understand which economic factors will have a direct

impact on the number of EV's sold worldwide. Economic factors are commonly used to assess and predict sales of vehicles in an upcoming year. Factors such as disposable income, interest rates, inflation, gross domestic product, exchange rates, unemployment rate, among others, all contribute to the acceleration or deceleration of the rhythm of production/selling of the automotive industry. Instead of studying each variable as separate we can translate all these components into one. The evolution of world GDP and GDP per capita.

Wu et al. (2014) state that there is a highly significant correlation between vehicle ownership and GDP per capita. The conclusion that derives from this findings is that when the economy thrives, the number of vehicles sold go along the curve of GDP and the inverse case can also be concluded. As such, and with the world economy being highly controlled by central banks and government policies due to a world pandemic, the expected outcome in the next few years is a steady but slow growth of the economy which can be translated into an also stable but slow growth of the amount of cars bought by consumers.

Figure 5

Evolution of world GDP compared with number of cars sold. Compiled by author.



Source: https://www.statista.com/statistics/265859/vehicle-sales-worldwide/ World Data Bank

3.3. Tesla, Inc

To better acknowledge the position of Tesla nowadays, the reader will be presented a small section that summarizes the history and the key events that led the company to being one of the most proliferous car companies in the world.

Tesla, Inc (TSLA) was founded in 2003 by Martin Eberhard and Marc Tarpenning in San Carlos, California and was known, at the time, as Tesla Motors. The group of engineers wanted to prove that electrical based vehicles could outperform fossil fuel vehicles following a favorable market test made by GM (General Motors).

Only in 2004 did Elon Musk joined Tesla with an investment of $30 million, becoming the chairman of the Board of Directors.

Originally, Tesla was only going to produce electric sports car and performed in according to their established goal. Tesla Motor launched, in 2006, the Tesla Roadster, being the first company in the world to produce a fully electric car that was in line with consumers needs and that could be commercialized. The model entered production in 2008 and had a battery large enough to travel almost 250 miles and could perform as well as other sport cars in terms of speed. Although it was a great achievement, it didn't take long for problems to arise. The base price of the vehicles was of $100 000, and it could take up to 48 hours to recharge which hoisted some debilities.

The company also suffered internally, struggling with its leadership. In 2008 both co-founders left Tesla and Musk was named CEO.

Furthermore, Tesla was on the verge of bankruptcy during the year 2009 and was saved due to two money entrances: Daimler AG (commonly known as Mercedes-Benz) invested $50 million for a 10% stake, and a loan from the US government for the amount of $465 million. With both capital entrances, Tesla was allowed to survive. In 2010 the company moved to Palo Alto, California and went public so it could solve their short-term capital needs.

During 2012, the Model S (launched in 2008 at a starting price of $76 000) was a huge success and launched Tesla back on track since it was the first vehicle that could be bought by the mainstream consumer due to the price reduction caused by economy of scales.

In 2015, Tesla announced a new line of products all related with solar energy after buying SolarCity and later, changed its name to Tesla, Inc to indicate that the company scope of the products would be all relatable to clean energies.

3.4. Tesla Products

Nowadays Tesla has 4 main car models that are available to the public.

Tesla vehicles:

- The model S: a premium sedan with a range of 400 miles that won the 2013 Motor Trend car of the year, the 2013 "World Green Car", the 2013 "Car of the Year" and an award by Times magazine as one of the best inventions in the world.
- The model X: a mid-sized crossover SUV, ranked as one of the most sold electric cars
- The model 3: launched in 2016, is the most affordable of Tesla's models and it's the most sold electric car in history. Not only was the most sold car in the USA but also on European countries such as Norway and Netherlands. Till December 2020, it sold almost 1 million Model 3 all over the world.
- The model Y: it's a compact crossover vehicle, built on a platform that shares a lot of components with model 3 and it's also an affordable car.

SolarCity:

- Tesla Solar roof: Tiles sold in order to harvest energy from the sun with a price of about $8500 for installing 12 panels, capable of producing 3 kilowatts of power.
- Tesla Powerwall: A large battery used to storage energy harvested with a capacity of 13,5 kWh and a standard price of $7000

Future products:

- Cybertuck: Tesla unveiled this vehicle in late 2019 and it's expected to begin deliveries late 2021.
- Tesla Semi: a transportation truck fully electric that will be available in a date that it is still to announce
- Tesla Roadster: After stopping the production of this model in 2012, Tesla announced that it was going to re-launch the vehicle in late 2021 but since the announcement has been made, no further confirmations were given of the possibility of still releasing it during the 2021 year.

3.5. Gigafactories

Tesla is also known for its giant factories that can produce not only the cars but also most of the components that are needed in production. These allow Tesla not to rely on outside suppliers and means that the production runs more swiftly.

In 2010 Tesla opened the Freemont factory, the first factory owned by the company, and remodeled it for 2 years, so it could start to assemble and sell Model S's (nowadays it can produce 600 000 cars a year and has more than 10 000 employees).

This was only the beginning of the production ramp up that Tesla had planned. Since 2010, the company opened three factories more. The architected strategy of the company allowed Tesla to continuing its expansion,

Tesla, s.d., gives the reader an overview of GigaNevada or Gigafactory 1. It is one of the largest buildings in the world and it is expected to be the biggest when the expansions are completely finished. The gigafactory was born out of the necessity and will supply enough batteries to support Tesla vehicles forecasted demand. The factory produces not only batteries but also Model 3 motor, electrical components and all the products related with solar energy. Nowadays, Tesla alone will require the entire worldwide supply of lithium-ion batteries if the production scales up accordingly. Furthermore, by reaching 20 GWh a year in battery power capacity, the company is considered the highest volume battery plant in the world. Tesla expects the cost of the batteries to decline significantly due to the technological advancements made and due to the economy of scales inherent to the production ramp up. In view of the above, Tesla will present in a near future a reduction in their models prices.

Tesla, s.d., also states that in 2017 the company opened a new gigafactory, called GigaNewYork or Gigafactory 2. A factory with the finality of producing only clean energy generation and storage products. The factory it is used to produce solar cells used in the solar roofs and powerwall and since 2019 a new line has been created to support the creation of components used in their supercharger networks.

With the growing consumption of electric cars in the Asian continent, Tesla has made the strategic decision of building the Gigafactory 3 or GigaShanghai. Since it was complete in 2019, it employed roughly 2000 people and contributed to the ramp up of the production. However, the factory is not finished and it is being expanded to allow more cars to be produced.

The unique vision of the management and their strategic thinking is allowing Tesla to operate and to gain an advantage among its competitors. As shown before, Europe, is, as of 2020, the biggest electric car market in the world. Tesla managed to understand the market preferences and it is building a fourth gigafactory in Berlin that

will start to produce in late 2021 and with enough space to produce batteries, battery packs, powertrains and car assembly lines.

Tesla won't stop with the GigaBerlin, there are already plans to build two more factories.

The first location is Austin, Texas, which will serve the eastern and central demands in the USA, suppling the Model 3. Other location is Asia, in a undisclosed location. The intention is to meet the demands of the Asiatic market and aid the Shanghai factory since it is close to reaching its full production capacity of 500 000 cars annually. Tesla plans to build more than 10 gigafactories over the years as stated by the CEO in 2017 (Field, 2017).

3.6. Supercharger Network

Tesla has also built a massive supercharger network along the years. In 2015 the company had 584 stations and nowadays it has more than 2500 stations worldwide, reaching the USA, Asia, Europe, Middle East and Australia.

The company offers this service in order to decrease growing concerns of the consumers regarding the cars range problems. The ultimate goal is to increase demand by changing the consumer perception and showing that there aren't any constraints regarding owning and circulating with an electric car.

The cost of using these recharger stations it is much lower than traditional fossil fuels. Tesla charges $0,25 per kW.

In a car like Model 3 that has an average capacity of 70 kW, the cost for getting 400 km is about $17,25. Tesla claims that a 15-minute recharge can get fill your car battery to have a range of 321 km which can meet consumer standards. Furthermore, Tesla offers features such as mobile applications so you can keep track of the charging time and the autonomy.

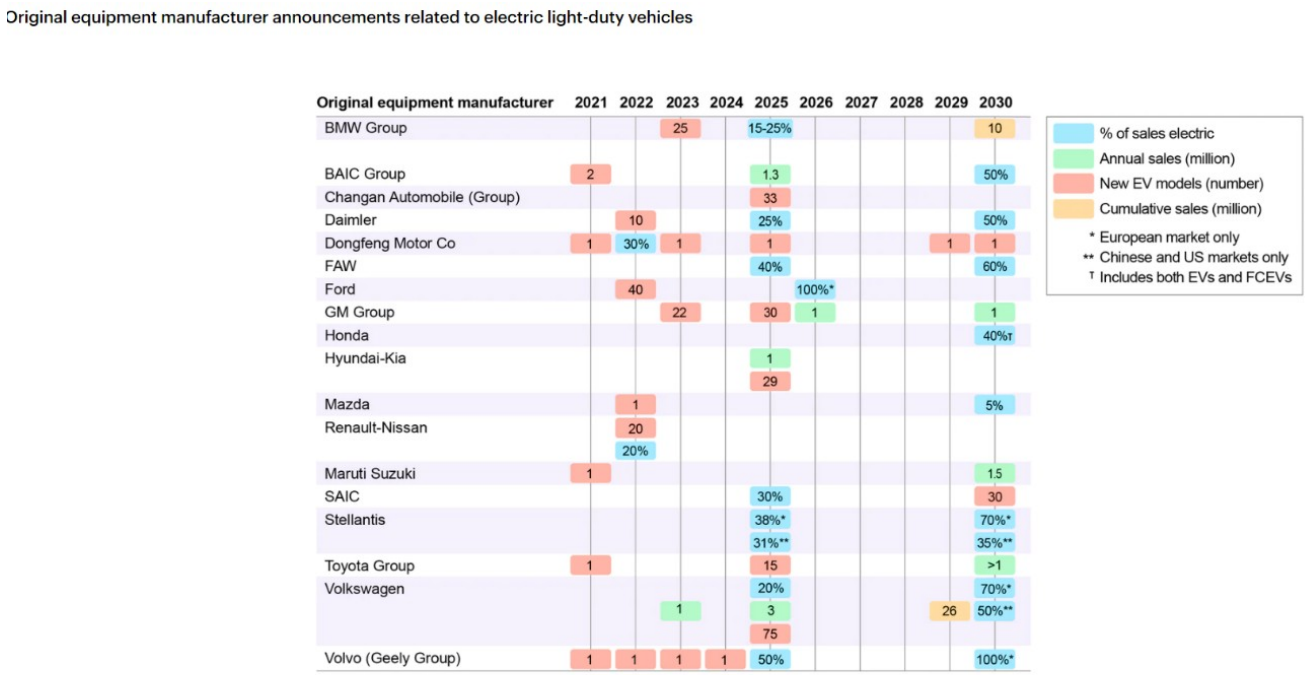
4. Competitive Scenario

4.1. Established Competitors

To understand the advantages and disadvantages of Tesla, there is a need to study and understand the environment in which the company is inserted. Analyzing the competitors and the alternative vehicles present in the market it is crucial to the completion of this work since it will give the reader/investor a full picture of the industry.

Figure 6

Original equipment manufacturer announcements related to electric light-duty vehicles. Compiled by The Global EV outlook 2021.



Source: https://www.iea.org/reports/global-ev-outlook-2021/trends-and-developments-in-electric-vehicle-markets

By analyzing the previous graphic, we can understand how complex the EV market will become in the following years, more than 100 new car models will be released by the legacy brands and an even greater number will be released by startup companies. Gersdorf, et al. 2020 remarks that automakers launched 143 new models in 2019 and the forecast till 2022 is to have more 450 models brought to the market by car manufacturers. We can also observe the % of sales of electric cars that some of the biggest and most widely known companies expect to achieve. For example, Ford, by 2026, wants to have fully transitioned only to the electric car segment.

Mehta & Patnaik, 2021 suggest that the main cause leading to an increase in the number of automakers are the government incentives. As stated in the Global EV Outlook report, 2021, significant incentives urged the initial uptake of EV's and supported the scale up of the EV manufacturer and batteries industries. The measures are compiled by purchasing subsidies, incentives given to clean energies and tax rebates to consumers on the buying and registration of vehicles. Furthermore, many economies have tightened the CO2 emissions which intensifies the roll of the EV's. One clear example of the investments that are being made, not only in an indirect way such as giving subsidies and incentives but also in a direct way, lies with the fact that US Biden administration announced the spending of $7.5 billion in EV infrastructure, including 500 000 new charging stations (Bellon, s.d.). This increase in support structure will lead the consumers to buy more cars since it mitigates one of the biggest problems of owning an electric car.

Legacy brands already expressed their intentions of going fully electric and each of them have their strategy to acquire a big market stake regarding EV's. As stated above Ford is one of the legacy brands going full electric. Moreover, Dearborn, 2021, illustrates Ford strategy to accomplish it. The company has plans to invest a total of $22 billion through 2025 in order to lead the market. Ford is not only creating new models, but it is also turning its most iconic models such as the mustang, f-150 and Transit, to fully electric vehicles. With more than 2 300 EV certified dealers across America the company is ready to charge the market in the upcoming years and turning their sales to 100% electric till 2026.

Additionally, Valdes-Dapena, 2021, points out that there are other major companies planning to spend big volume of capital in order to compete in the EV's market. General Motors announced in 2021 an investment of $35 billion only in EV's production, ranging from assembly lines to battery cells and it hoped to produce zero-emissions vehicles till 2035.

In addition, international legislators are creating barriers to fossil fueled cars and are imposing restrictions to major economies to prohibit fossil fueled cars in a short time horizon. (see Annex A)

Summing all up, the industry of EV's is suffering a fast paced change that will resonate in a race for consumers preferences, revolutionizing the traditional car manufacture brands and creating a new environment and new requirements to be able to compete in this market.

There is no doubt that the number of competitors in the market is unsustainable. The capital needs to invest in EV's technology is massive and it will result in a market controlled by a short number of companies, composed by the traditional brands and some new emerging brand, such as Tesla for all we know now.

4.2. New entrants to the EV's Market

To put into perspective what was affirmed above, this segment will be entirely dedicated to give the reader an overview of some of the most coveted companies by the market that began their activity in the last few years and others that have a modest journey so far but are planning to expand so they can earn a significant place in the EV industry. Furthermore, it will be presented the main factors causing hindrance to new joiners.

Nio (NIO)- The Chinese company was founded in 2014 by JAC motors, a governmental entity that focus on building premium fully electric vehicles. Rexaline 2020, points out that it is estimated that the company, by 2025, will have a 30% share of the premium EV market and 7% market share overall.

Nikola (NKLA)- Founded in 2014 in the US, Nikola focus mainly on pure electric and also hydrogen electric powertrains across multiple applications. The target market of the company is heavy trucks fully powered by hydrogen fuel-cells. Moreover, it has already launched a full electric SUV. Despite being valued at $10 billion, the company has an annual revenue of $1 million. This situation can be explained in most part by their advanced car technology and investors' confidence in the future of the company.

Rivian – Founded in 2009 in the US, Rivian is a privately held company that will come public in late 2021. Despite only launching its first vehicle in 2018, the company has gathered massive investment by some of the biggest corporations in the world such as Amazon and Ford. With an annual revenue of about $1 billion, Rivian is set to be one of the companies that can achieve a relevant stake in the market of EV's.

Other companies that have a solid position in the market and are fighting for a place among the big corporations are, Kandi Technologies Group Inc., Arcimoto, Ztractor, Lucid Motors, among many others.

The market of EV's is still growing but the number of companies present on the market will certainly diminish derived from the fact that there are too many requirements to be successful in this segment of the market.

Fehrenbacher 2017, indicates that the capital requirements are extremely high and the gap between making a drivable prototype and a mass-production car in a factory is wide, as such, this market was known as the "valley of death". Taking this into consideration, the legacy brands have an unique position to pursue a big share of the market given the fact that they have the capital required to invest in not only the prototypes and mass production but also in all five areas that are deemed critical to achieve success: Brand, Customer Experience, Production Strategy, Talent and Business Model.

4.3. SWOT Analysis

The SWOT analysis is tool and a strategic planning technique used to help an organization identify strengths, weaknesses, opportunities, and threats. (see annex B)

To further analyze Tesla's position, a model will be used to explain the context of the company.

Strengths:

(i) Tesla is one of the most attractive companies to work in as an engineer due to its diversity. The high degree of technology innovation, the stimulating environment and market perception of the company, makes it one of the most wanted companies to work in and as such it is one of Tesla strengths since it can attract the best talent to keep improving the company as hole. (ii) Tesla is also the biggest EV seller in the world. As we can observe in graphic 3, it sold almost 500 000 units last year, outmatching its rivals by several hundreds of thousands of units sold. Its only possible to accomplish this if your product stands out among consumers. (iii) As stated previously, Tesla car models have won several awards regarding quality, innovation and improvement, making them the best in-class cars and in essence, the best EV's cars overall. (iv) Tesla has a high rate of technology innovation which can be translated into a market trust that the company will

develop competitive and profitable products which will lead to sustainable financial gains.

Weaknesses:

(i) Due to the high degree of technological expertise needed to compile products and to expand their product range offering, the mechanical complications are always a possibility and so it increases the risk of not being able to meet consumers expectations. Tesla, continuously delayed their new models launch and production on account of a hard transfer from a single prototype to a full scalable production vehicle. (ii) Being a very coveted company makes the company have bursts of orders that cannot be delivered in time since the company doesn't have the infrastructure to respond to the market. It is important to understand that Tesla is currently addressing this problem by creating at least half a dozen factories across the world to be able to meet demand and lower costs. Battery supply is also a limitation for a company as Tesla. (iii) The company can only produce as much cars as the number of batteries it produces, and this does affect the capability of Tesla of delivering and ramping up production. This matter is also being taken care of, the company is creating factories where its main activity is battery construction.

Opportunities:

By analyzing the markets with the biggest growth potential there are two that stand out and that can give Tesla an opportunity to expand even more. As mentioned previously, Europe is the market where the highest number of units were sold due to great government incentives given to consumers followed by China which is the largest market in the world. Both these markets are still unsaturated and pose a big opportunity. Tesla is aware of the fact and already created a Gigafactory in Berlin and one in Shanghai. Furthermore, Tesla has plans to create several more factories, being most of them located in Asia to respond to the demand in the market and drive down costs.

With the production ramp up and scalable car models, Tesla can reach its main objective. Being able to drive down the price of their models over and over so it can reach the population with lower income.

This is only possible since the market has trust in the brand. The high level of confidence on the market in Tesla can be noticed in the price of their stocks, with a 700%

increase in the last year, we can say for sure that the market has confidence that the company will thrive due to their extremely well made and attractive cars.

Last, Tesla's pick-up is a big opportunity of conquering a bigger market share. In the US alone, Manzi, 2019, states that 17,6% of cars sold annually are pickups. By introducing one of the first fully electrical pickups, Tesla has a big opportunity of acquiring a share of the market of this variety of cars.

Threats:

Tesla assured quality in manufacturing and innovation through their added functionalities presents a threat to the company since it can lead to product liabilities claims. (i) Functionalities as the auto pilot pose a big threat to the company in the case of accidents caused by the system, something that can jeopardize the reputation of the company. In several cases, Tesla had to fight lawsuits related to this added capability, suffering financial setbacks, and damaging the confidence in the system and in the brand. The auto pilot functionality can affect the number of cars sold since there is no proper regulation to self-driving cars and there are a lot of prohibited areas where cars with this functionality cannot circulate and though consumers can be reluctant in buying cars with this type of function, posing a threat to Tesla.

(ii) The number of participants entering in the EV market pose a big threat to Tesla's activity. Legacy brands are preparing a full launched attack to the market that can make Tesla position vulnerable since they have the production power and the capital to outmatch Tesla.

(iii) Being a market highly dependent on customers, the threat of customer lack of adaption to this new market and the possibility of a trend change, can be a limitation to the success of the company in the long run.

(iv) Last, Tesla production relies on materials like aluminum, steel, lithium, nickel, copper, cobalt, and lithium. The price fluctuation of this materials can affect the company and poses a threat to the company production line since it can cause a high financial deficit and an interruption in the assembly lines due to the lack of materials available. .

4.4. Sustainable Competitive Advantages

The biggest competitive advantage acquired by Tesla lies with the company strategy of reducing costs by being vertically integrated. Chua, 2020, says that this integration, included design, manufacturing and sales. This allows the company to control different parts of the same product chain, reducing uncertainty, dependency on third parties, assembling cars faster, lowering costs and improve quality control. Tesla makes their own batteries, electronics, parts, and even the car seats. This allows them to build highly customized and superior components. This flexibility of the supply chain promotes a more efficient and accurate response to the market and a higher degree of growth of the value chain.

Furthermore, Tesla understands the consumer and created a simple strategy to sell cars through their website. Although the activity of buying a car is traditionally time consuming and generally not well organized, Tesla understood how to bypass this problem by offering a simple solution to its customers. The strategy consists in a non-complex approach to ease the consumer effort by providing a simple web page where you only need to choose the car model, the extras that normally are not more than three options, provide your address and pickup point and provide your billing information. This stands out to costumers since it doesn't take much time and there is no negotiation. Consumers know that they are buying all the same product for the best price available in the market. Dealerships tend to negotiate in order to increase margins which is a lengthier process and can take up to several days in order to receive the proposal from the car manufacturer.

Fortuna 2020, shows that Tesla battery supply chain is also giving Tesla a competitive advantage. Tesla currently produces more batteries in terms of kWh than all other carmakers combined. With the production ramp up caused by some gigafactories being focused mainly on batteries, the possibility of achieving economies of scale will beneficiate the company since it will lower the manufacturing cost, it will promote innovative manufacturing and will lead to a reduction of waste. Therefore, it will compel with the company strategy of lowering the prices more and more and it will be more attractable to consumers.

Fortuna, 2020 also states that the supercharger stations owned by Tesla also give the company a competitive advantage. It provides infrastructure to its customers so they can rapidly charge their vehicles in any location. Currently, Tesla has most of its

supercharging station in the US but is already planning to create thousands more all over the world, mainly in markets that are perceived as the most promising ones, like China and Europe. The goal is to support their customers experience and to encourage the consumer to feel that the range problem and the recharging problem is now obsolete.

Last, Galloway, 2021 sugests that the company acquired a natural advantage, obtained through the company strategy, the employees and managing team. The inbound strategy of going for a green planet instead of only chasing profits, the highly skilled employees that keep improving tesla cars and software's and the managerial skills of Elon Musk, that is considered one of the most influential personalities in the world, all lead to a last competitive advantage that cannot be copied by other companies.

5. Weighted Average Cost of Capital (WACC)

The WACC is a widely accepted and useful instrument that combines the cost of capital across all sources. It reflects the investor's expected risk related to Tesla's equity and debt. Furthermore, it is used to discount cashflows to the net present value, in order to achieve a fair valuation of the company. After considering the risk-free rate, cost of capital, cost of debt, tax rate, systemic risk and capital structure, a rate was computed and we concluded that the WACC used, for the purpose of this paper, is equal to 7,67% and will be deconstructed below.

5.1. Cost of Debt

The cost of debt represents the required return to fund a company based on its operational and financial risk. It can be obtained by looking for the company credit rating and corresponding risk outlaid by its activity. Tesla was attributed a BB rank by the credit rating agencies, corresponding to a non-investment grade and an elevated vulnerability do default risk in the event of adverse changes in business or economic conditions. The BB rating matches a default spread of 2,77%. By adding the risk-free rate to the default spread we can conclude that the cost of debt laid out by the company is 4,21%.

5.2. Cost of Equity

The cost of equity is the return required by equity-holders to compensate for the risk they undertake. It was computed trough the CAPM model, using the risk-free rate, beta and market risk premium. The cost of equity was computed and laid out a value of 13.07%.

5.2.1. Beta

To measure the risk of the company we need to compute the beta. The beta is a measure of risk associated with stock volatility. The average stock market beta is 1, meaning that a beta higher than 1 will translate in a company with more volatility in their stocks than the average and a beta lower than 1 will translate in a company less volatile in their stocks than the average. To compute the beta, a regression between the daily stock value of S&P500 and the daily stock value of Tesla was made. The beta value for the company is 2,05. This number was validated after comparing it to the same variable calculated by the biggest stock market platform such as yahoo finance, google finance and CNBC.

5.2.2 Market Risk Premium

The definition of risk premium reflects the expected return of an investors in a specific market. It is computed by calculating the spread between the risk-free rate and the expected market returns. The risk-free rate is obtained by observing the US treasury bonds risk and the market return was obtained through Charles Schwab corporation. The MRP for the company is 5,7%.

5.3. Tax rate

The average tax rate in the US is a combination of federal income corporate tax and state income corporate tax, combining to an average of 25%.

5.4. Capital Structure

The last step to compute the WACC is to analyze the financial structure of the company. With the assumption that would be inaccurate to use the market values of both equity and debt that of Tesla's due to its overvaluation, the financial data provided by Tesla K10 report was used.

To obtain the equity value of the company we simply observed historical data of the company from last year. The same was done to obtain the debt value of the company. The equity and debt values are 23 730 000 000$ and 28 418 000 000$, respectively. The weight of debt and equity in the company were computed to further use in the WACC calculation. After calculation we could conclude that the equity represented 45,5% of the company value and the debt represented 55,5% of the company value.

6. Forecasting

In this section we will explain the rational used to compute the forecast of Tesla's activity. It is important to understand that to compute the forecasts that will be covered next, assumptions were made that were in line with the information that was available online about Tesla's activity and their modus operandi.

To initiate the financial analysis of the company we began by collecting all data available about Tesla's financial information. The K10 report was the primary fount of information used in this work. This document is the annual report of financial information required by the government to expose to the markets Tesla's true financial position. The discounted cash-flow valuation was the model chosen to conduct this work. This decision was made after analyzing each valuation model and based on a survey, mentioned previously, conducted by Bancel & Mittoo, 2014, where they interviewed 356 experts in valuation across 10 European countries. The conclusion was that DCF method is the most used method to estimate the fair value of an asset and so, it was the model used to assess all values from this moment onwards. To begin the valuation, we collected all data regarding the last 5 years, we analyzed it and used it to make assumptions valid for the following 5 year that we are predicting.

6.1. Revenues and other income

To estimate Tesla revenues every year we started by dividing the company into three segments. The car manufacturing segment, the solar energy segment and the extra exploration assets. Starting in the car manufacturing segment, we analyzed data about last 3 years of car sales, in each quarter, per model. The goal was to understand what is the ratio between the number of vehicles produced and the number of vehicles delivered and what was the number of vehicles that used the leasing regime. The next step was to acquire Tesla's factory installed capacity to acknowledge their used installed capacity, so we have a reference for further use. We could conclude that the average used capacity of all factories was about 65% meaning that the company only produced 65% of the cars they announce that they are able to produce. Of course, this is relative data point. Being a highly specific industry with a high degree of technology and a lot of costs, Tesla only makes the number of cars it is ordered, never having to much stock, lowering the risk of not being able to sell and improving financial indicators. Nevertheless, the 65% meta was used in the following calculations.

Following this, it was important to understand Tesla's production expansion plans. The company has some of its factories already finished and producing and some that are still under construction but that have segments of the factory that are already producing. We gathered all information about the capacity of the factories for each year and which factories would open in the future, their initial capacity and their capacity in the following years. From here we could say how many cars Tesla could produce each year till 2025. Based on Tesla's reports we could see the number of cars they could produce in each factory, and we could cross this data with ours used capacity. But there is also the possibility of improving this 65% usage of installed capacity and we expect Tesla to fully use their assets since they invested big amounts of capital in order to use 100% installed capacity and not only 65%. We estimated an increase of 8% usage in each year in all factories that are under construction till it could reach 100% installed capacity or near this value as late as 2025. Note that we only had information about the factories that are going to open, and this work doesn't contemplate the factories that were announced following and that there was no data available at the time.

Considering that Tesla doesn't make available how many cars of each model it does per factory and only makes available which models are made in each factory, we had to create an assumption to understand how we could divide the factories installed capacity per model. We gathered all data available about the number of cars sold by model by Tesla and we created a ratio for each assembly line to know how many cars of each model they would produce and so, used it for next years. Furthermore, we collected all data regarding model prices with and without every extra option and performance and we made an average price for each car model each year, adding inflation. Following this, we knew the installed capacity of all factories till 2025, how much was the usage of the installed capacity, how many cars of each model they would sell and what were the prices of each model. Through all this, we could know the revenues of Tesla's manufacturing segment, divided by automotive revenues and leases regime revenues.

The next step was to estimate the solar energy segment sales. In this segment there are two main products: the tesla solar panels and the powerwall. We started by collecting data about the solar panels, the price per 12 panels installation, the amount of power it output for 1 year and the average price per square feet of solar panel. Using this we calculated how many panels had to be sold to generate 1 MW of energy since we knew the wattage of each panel, concluding it had to sell 2941 panels per MW of energy. We

then observed the amount of MW sold by Tesla (only measure available in K10 report) and we assessed that they sold 205 MW of energy generation in 2020. Having the panel wattage and the revenues of the segment, we could now know the number of panels they sold each year and using the price per panel sold we could know the revenue of panels in 2020. The next step was to obtain the revenues of the Powerwall and as such, a similar process was used. We knew the powerwall price and MW sold in each year and what was the wattage of each powerwall, through this data we computed the price pew MW of powerwall product of 2020.

These segment assumptions were very volatile and so, we made a prediction for a previous year to increase the confidence in our model. To do that, we forecasted 2020, a year which we already had data regarding the solar energy revenues only to find out if the prices made sense. The actual revenue of this segment, in 2020, was of $1 994 000 000 and our estimation was $1 994 046 296,30. This approximation made us believe that our prices and prediction would make sense for the following years. With the prices already calculated we made and assumption regarding the amount of MW sold in panels, in this segment and in the storage segment and multiplied by the prices we got to know the revenue of this segment in each of the following years. This MW predications were made based on installed capacity and used installed capacity increment.

The last segment of revenue is the most volatile one due to the fact that the extra exploration assets are based entirely on cryptocurrencies. Tesla invested 1,5 billion dollars in Bitcoin before the big boom of this cryptocurrency which meant a big profit for Tesla if they liquidated when the price was at its highest point. There is no information about if Tesla sold or kept its investment, so we assumed that this is a long run investment.

We used price predictions of bitcoin available online to compute the profits or loses derived from bitcoin, each year and added it to other incomes.

To conclude this part, the yearly forecasted revenues are as shown in annex C.

6.2. Profit Margin

To assess the costs of production and selling its products to consumers, historical data for the past 5 years was used to get the margin lost in their revenues for each year, in each segment. Succeeding this, we made an average for each segment compiling the margin lost each year and applied it to the revenues forecast we already had made

previously. The same process was used to compute R&D, Selling, general and administrative costs.

After computing all operation costs and subtracting it to the yearly revenue, we reached the first measure of Tesla's operational activity, the EBITDA.

6.3. Debt and interests

To further continue the forecasting of Tesla financial information, all the debt needed to be studied, including interests paid in each year, plus new debt interests and amortizations had to be accounted for. The K10 report suggested and investment ranging from 4,5 billion dollars to 6 billion dollars for the next 3 years. We computed an average of yearly investment based on these values and widened the window of investment to 5 years, meaning that tesla will invest an average of 5,25 billion dollars in the next 5 years, of which, 80% would be financed through debt. The interest rate used to this future debt was the cost of debt supplied by the agency credit rating plus the risk-free rate and the maturity was in 20 years. See in annex D.

Using the debt map supplied by the K10 report we had access to Tesla previous debt, accorded interest rates and maturity dates. Adding all of these previous engagements to the new yearly debt, we could compute the interests paid in each year in the short run and the long run, the amortizations done in each year and the amount of debt remaining for the following years. The map of debt with all this summarized information for the next years can be seen in annex E.

6.4. CAPEX and depreciations

Future capex investments and depreciation of already owned capex are also an input needed to calculate the DCF model. There were two main components in this part. The first one was computing all depreciations of already owned assets, ranging from the solar energy segment assets to the PPE assets, the intangible assets, and the inventory.

The second part was to understand the impact of future investments in CAPEX. New investments were added each year and a proportion was made to understand if the investment was going to be made in tangible or intangible assets. To do this, a ratio based on historical data was computed.

Following what was above mentioned, it was observed the increase of investment for previous years and reconciled with the increase of each item line of the assets in order

to compute a ratio that could be used further. The ratio calculated was applied to the investment of 5,25 billion each year. Depreciation ratios were also computed using historical data and applied to the new investment in each item. In annex F it is possible to see how the new investment was divided by segment for each year. After all these procedures, we came up with a yearly CAPEX depreciation, counting with previous assets and new assets.

6.5. FCFF inputs

The last inputs needed to proceed with the DCF valuation was the working capital net and the working capital variation. To compute the working capital net two variables were still needed: the accounts receivable and the accounts payable.

For both variables it was used the average period of receipts and the average payment term, respectively. Both these terms were computed based on historical data. To finalize, the revenues were multiplied by this average period and then multiplied by the corresponding number of days that each year has, depending on if it's a regular year or a leap year. After calculating these variables, we computed both the working capital and the working capital variation as seen in annex G.

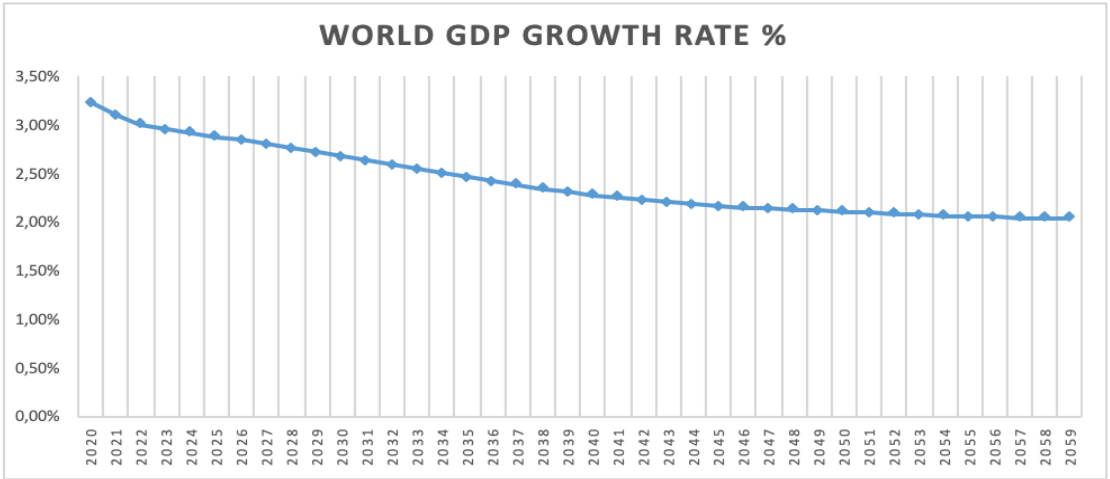
6.6. Discounted Cash-Flow Valuation

6.6.1. Growth rate of the perpetuity

After all calculations were made to assess the discounted cashflows of each year, the only remaining variable to calculate is the terminal growth rate value. In a perpetuity, Tesla can only grow as much as the global GDP growth average projections.

Table 6

World GDP growth rate forecast in % till 2060.



By analyzing the previous graphic, we can estimate an average growth of 2,42% in world GDP. This will be the value used to calculate Tesla's future value, in the perpetuity.

6.6.2. Valuation results

In this section, the results will be explained, and the reader can finally understand if Tesla is going to be a profitable company or a waste of time.

Table 7

Enterprise value of Tesla and maximum share price in the future. Compiled by the author

NPV(WACC) / Enterprise Value ($)	$ 292 982 537 270,72
Net debt ($)	$ 3 981 914 104,41
Equity Value ($)	$ 289 000 623 166,31
Number of shares outstanding (N)	959850000
Share Price ($)	$ 301,09
Book share price 2020 ($)	$ 23,82

As it can be seen in the data above, Tesla will grow a lot in the next years according to the data collected in the making of this work. The 5 years prediction made in this paper led us to believe that there won't be any negative cashflows in the next years. The main reason for this outcome is that Tesla is now a well-established company and will not present anymore high loses as it did in the past.

With a book share value of $23,82 in 2020 and a top ceiling of $301,09, the possibilities of growth in the long run are tremendous and as such, our predictions is that the company will thrive regarding internal value.

6.7. Relative Valuation

This valuation method uses similar companies to evaluate the target company. Even though these companies carry out their activity in the same segment as Tesla, there is substantial differences that this model does not consider.

Table 8

Relative valuation: multiples per company.

	P/Sales	P/Earnings	P/FCFE	P/B	EV/S	EV/EBITDA	EV/EBIT	EV/FCFF
Toyota	1.01	17.34	49.32	1.16	1.59	12	22.24	78.01
Ford	0.4	15.95	3.55	1.57	1.18	11	19.06	10.45
GM	0.72	25.78	13.25	1.73	1.41	10.01	49.35	26.15
Audi	1.22	21.29	34.34	2.47	0.96	6.46	9.71	26.88
Tesla	19.24	621.78	176.7	28.97	19.02	148.83	310.21	174.73

Compiled by the author. Source:www.alphaspread.com

From what we observe in the table above, all 4 companies that are used to compare to Tesla, are long established brands with a very substantial structure something that can only be achieve by being in business for decades. Throughout the work they were referred as legacy brands.

It's hard to point out a conclusion that is consensual about if Tesla will thrive in the market when analyzing the graphic. The only true conclusion that we can obtain by observing the graphic is that Tesla has an extensive volatility since it has multiples like several times bigger than its direct competitors in the EV market and all of them are directly or indirectly linked to the stock price of Tesla.

6.8. Scenario Analysis

To further validate the results, a scenario analysis tool was used to assess what would be the Enterprise Value and the stock price in perpetuity. To determine these values in different economic world conditions we defined 5 scenarios as can be seen in annex H.

Even though there is a huge difference between the worst-case scenario and the best-case scenario, we can say with a high degree of certainty that Tesla will grow in the upcoming years.

6.9. Sensitivity Analysis

The last tool used to validate the results of this paper was the sensitivity analysis.

This tool was used to evaluate the uncertainty of the results. The goal is to check how independent variables impact dependent variables. We used independent variables to predict changes in the dependent variable, that appear in annex I.

The conclusion withdrawn from this tool is that the Enterprise Value will be higher than $192 100 932 222,426 in 90% of the times and the book share price will be

higher than $253,98 in 90% of times, which further strengths the assumption that Tesla will grow no matter the changes in world economy conditions. (Annex J).

7. Conclusion and buying recommendation

With this paper coming to an end, it is important to give the reader some final remarks. The questions introduced in the first section of this paper will now be answered after a long and extensive research.

i)Why is Tesla able to compete in a market dominated by legacy brands such as Mercedes, BMW, Toyota, Volkswagen and what is their strategy?

Tesla is in fact, one of the biggest and most proliferous companies in the world today, showing a culture of innovation, work, the ability to stand out among its competitors and a presence that can change the entire electric car market. Being a relatively new company was not a barrier on fighting the legacy brands that, as the market knows, have the power to outmatch its competitors in the technology field and in model prices, design and customer experience. Even though the legacy brands are able to outmatch its competitors, Tesla's market position, customer perception of the brand, the enhanced customer experience and having vertically integrated their activity to drive down costs, are critical factors and thus, the company is able to fight for a place among the highest selling brands.

To finalize, we will answer what the reader surely must want to know:

ii)Is Tesla finances justifying their stock performance? and;

iii)Is Tesla worth investing in?

Both interrogations can be merged into one answer. Notwithstanding the fact that Tesla is an unique company with a management that can achieve great results, the main purpose of this work is to give the public a fair assessment of whether Tesla is overvalued and if you should invest in the company. This paper conclusions are based on available evidence and mathematical models that gives us a final assessment about market perspectives on the new technologies, meaning, this paper serves the purpose of giving the reader an understanding of Tesla's value and how it will evolve in the long term in the stock market and doesn't account for the speculation factor. Finally, it is possible to state, after extent research and calculations, that it's not reasonable to buy Tesla stocks. Even though Tesla's activity will grow, and the stocks can reach a considerable value, the current value of the stock (more than $700) doesn't reflect the company true position neither the future position.

From a financial and mathematical point, we can honestly say that the company is, in fact, overvalued. More than half of the price of the stock nowadays is pure

speculations and this aspect cannot be included in a work of this nature. Of course, it is possible that Tesla keeps increasing its stock price due to speculation but with time passing by, the market tends to correct the price of an asset to its intrinsic value or near that value. As this work was constructed by an adept of the value investing fundamentals, the reader is encouraged to go back to the first citation of this work to understand the main idea we want to underline. To sum up the quote, it says: buy below the intrinsic price and sell it above it. This is the main idea to retain.

Tesla is way over its intrinsic value and therefore, there is no evidence that support Tesla's stock growth in the long term. The most probable outcome is the stock price to decrease as it was presented in sensibility analysis. The rising prices of Tesla's stock nowadays cannot be used to explain future growths. If the investor/reader uses this argument, it is just using an extrapolation of the random walk hypothesis, that states you can't use the tremendous past growth to predict a future growth. In the future, Tesla will be just as equal as any legacy brand, it will continue to be an ultra-modern company but the hype of being a new emergent company will surely pass by, it will blend among its competitors, it will stabilize in the market and will stop being a trend.

No one can give reasonable assurance to if speculation can make Tesla stocks grow even more but it is still possible.

To end this last chapter, we present the biggest limitation faced in this work. Our conclusion is that the biggest limitation is time. While times passes the information gets outdated, new news about Tesla projects, factory delays and problems are hitting the social media and therefore, changes had to be done continuously, so the results can remain reliable.

Another huge limitation in this paper is not accounting for speculation. This paper relies on mathematical models to evaluate the financial nature of Tesla and even though we emit a negative buying recommendation, the stock value can actually increase if you buy it at the time you are reading this. Furthermore, your investor profile is also important to make the decision of when and what to buy. If you are a risk averse maybe you should not consider buying Tesla's stocks. If you are risk drone, maybe you could invest in Tesla and hope to get a positive return. If you are an adept of the value investment fundamentals, it is more than obvious, with the data gathered till today, that in the long term, the price of Tesla's stocks won't give you the return you are hoping for. Even though that what was stated previously is true, to get a fully complete picture of what could be Tesla's

stocks value in the future, it is needed to combine both fundamental valuation analysis with the deep study of brand perception and market speculation, in order to give the reader an even more complete answer to whether it is viable or not to invest in Tesla.

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9. Annexes

Annex A

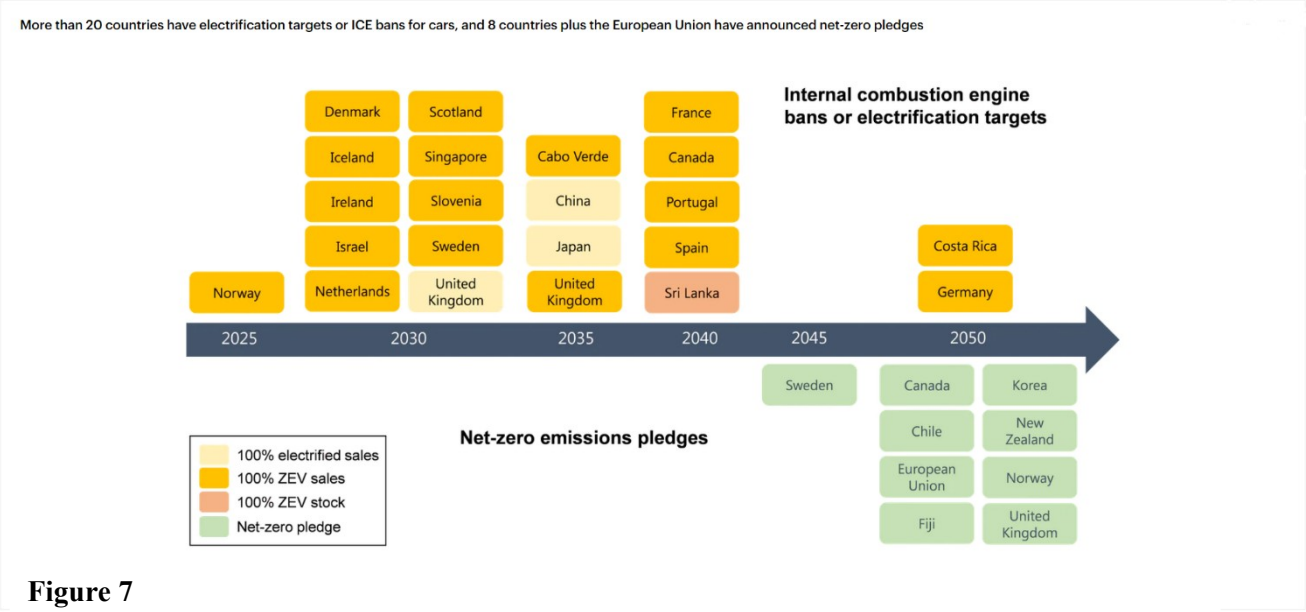

Figure 7

Target ICE bans for car in largest economies: Compiled by The global ev outlook 2021 https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment#abstract

Annex B

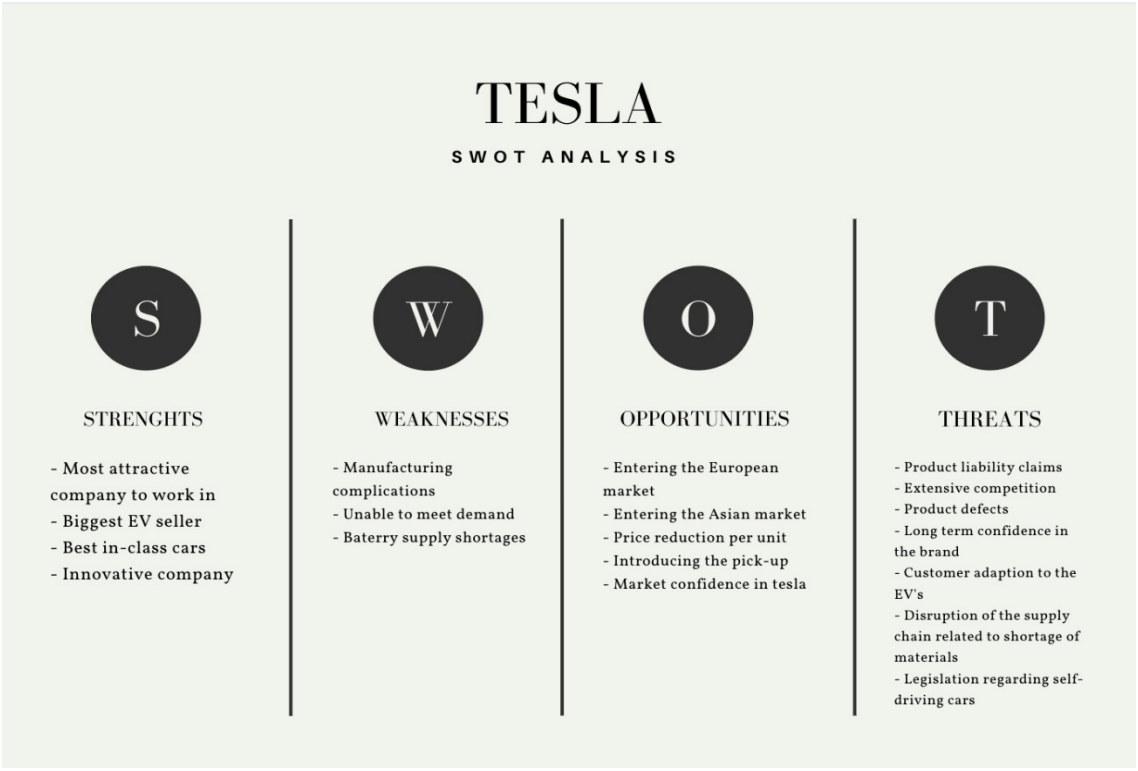

Figure 8

Tesla SWOT analysis. Compiled by Author.

Annex C

Table 1

Forecast of Consolidated Statement of Operations

Consolidated Statement of Operations	*31/12/21*	*31/21/2022*	*01/01/23*	*31/21/2024*	*02/01/25*
	USD	*USD*	*USD*	*USD*	*USD*
(In thousands $)	*US GAAP*	*US GAAP*	*US GAAP*	*US GAAP*	*US GAAP*
Revenues					
Automotive sales	$ 40 485 886 397,24	$ 68 688 377 317,36	$ 81 510 283 805,32	$ 89 272 297 293,40	$ 97 034 310 781,48
Automotive leasing	$ 600 007 525,79	$ 1 003 106 891,18	$ 1 190 354 621,56	$ 1 303 709 013,14	$ 1 417 063 404,72
Total automotive revenues	$ 41 085 893 923,02	$ 69 691 484 208,54	$ 82 700 638 426,88	$ 90 576 006 306,54	$ 98 451 374 186,20
Services and others	$ 3 650 359 313,78	$ 6 191 880 817,99	$ 7 347 705 426,65	$ 8 047 408 408,48	$ 8 747 111 390,31
Energy generation and storage	$ 2 387 032 406,56	$ 2 878 341 617,51	$ 3 597 760 621,80	$ 4 624 576 511,74	$ 6 076 511 259,71
Total revenues	$ 47 123 285 643,36	$ 78 761 706 644,03	$ 93 646 104 475,33	$ 103 247 991 226,76	$ 113 274 996 836,22
Cost of revenues					
Automotive sales	$ 31 407 395 118,37	$ 53 285 803 978,18	$ 63 232 546 388,28	$ 69 254 018 220,28	$ 75 275 490 052,27
Automotive leasing	$ 323 209 215,95	$ 540 348 875,44	$ 641 214 597,15	$ 702 275 804,64	$ 763 337 012,13
Total automotive cost of revenues	$ 31 730 604 334,32	$ 53 826 152 853,61	$ 63 873 760 985,44	$ 69 956 294 024,92	$ 76 038 827 064,40
Services and others	$ 4 568 075 387,51	$ 7 748 546 358,23	$ 9 194 950 258,04	$ 10 070 561 586,98	$ 10 946 172 915,92
Energy generation and storage	$ 2 183 883 639,14	$ 2 633 379 902,63	$ 3 291 572 639,71	$ 4 231 001 202,25	$ 5 559 368 815,74
Total cost of revenues	$ 38 482 563 360,97	$ 64 208 079 114,48	$ 76 360 283 883,18	$ 84 257 856 814,15	$ 92 544 368 796,06
Gross profit	$ 8 640 722 282,39	$ 14 553 627 529,56	$ 17 285 820 592,15	$ 18 990 134 412,60	$ 20 730 628 040,16
Operatin expenses					
R&D	$ 2 669 566 232,51	$ 4 461 904 334,58	$ 5 305 115 611,11	$ 5 849 069 036,47	$ 6 417 105 734,73
Selling, general and administrative	$ 5 332 543 868,20	$ 8 912 796 509,83	$ 10 597 137 983,56	$ 11 683 702 335,35	$ 12 818 373 794,46
Restructuring and other	$ 116 421 023,08	$ 194 585 720,03	$ 231 358 555,36	$ 255 080 616,84	$ 279 852 961,03
Total operating expenses	$ 8 118 531 123,79	$ 13 569 286 564,43	$ 16 133 612 150,02	$ 17 787 851 988,65	$ 19 515 332 490,22
EBIT	**$ 522 191 158,60**	**$ 984 340 965,12**	**$ 1 152 208 442,13**	**$ 1 202 282 423,95**	**$ 1 215 295 549,93**
Interests income	$ 128 207 660,20	$ 172 225 364,20	$ 218 708 514,37	$ 286 860 271,59	$ 360 925 382,05
Interests expenses	$ 666 365 833,33	$ 745 909 395,83	$ 775 985 244,71	$ 831 058 771,61	$ 913 794 668,57
Other income (expense), net	$ 557 300 889,41	$ 1 242 197 114,74	$ 1 299 778 816,15	$ 1 336 924 623,59	$ 1 375 715 043,57
EBT	**$ 541 333 874,88**	**$ 1 652 854 048,23**	**$ 1 894 710 527,94**	**$ 1 995 008 547,52**	**$ 2 038 141 306,98**
Taxes	$ 135 333 468,72	$ 413 213 512,06	$ 473 677 631,98	$ 498 752 136,88	$ 509 535 326,74
Net profit/loss	**$ 406 000 406,16**	**$ 1 239 640 536,18**	**$ 1 421 032 895,95**	**$ 1 496 256 410,64**	**$ 1 528 605 980,23**
Equity Earnings/Loss Unconsolidated Subsidiary	$ 141 000 000,00	$ 141 000 000,00	$ 141 000 000,00	$ 141 000 000,00	$ 141 000 000,00
Net Income	**$ 547 000 406,16**	**$ 1 380 640 536,18**	**$ 1 562 032 895,95**	**$ 1 637 256 410,64**	**$ 1 669 605 980,23**
Net loss per share of common stock attributable to common stock holders					
Basic	$ 0,57	$ 1,44	$ 1,63	$ 1,71	$ 1,74
Diluted	$ 0,49	$ 1,25	$ 1,41	$ 1,48	$ 1,51
Weighted average shares used in computing net loss per share of common stock					
Basic	959850000	959850000	959850000	959850000	959850000
Diluted	1108843750	1108843750	1108843750	1108843750	1108843750

Compiled by author

Annex D

Table 2

Tesla's future debt and future debt conditions.

New Debt	*2021*	*2022*	*2023*	*2024*	*2025*
	$ 4 200 000 000,00	$ 4 200 000 000,00	$ 4 200 000 000,00	$ 4 200 000 000,00	$ 4 200 000 000,00

Maturity in years	*I*
20	4,21%

Compiled by author

Annex E

Table 3

Tesla's future debt situation.

Total financial debt and interests	*2021*	*2022*	*2023*	*2024*	*2025*
Total short term debt	$ 2 834 203 465	$ 2 545 519 255	$ 1 735 615 670	$ 1 189 120 771	$ 1 053 604 403
Total long term debt	$ 10 552 000 000	$ 11 707 796 535	$ 13 152 277 280	$ 15 406 661 609	$ 18 218 040 838
Short Term fiancial leases	$ 373 000 000	$ 574 846 777	$ 48 100 671	$ 48 100 671	$ 48 100 671
Long term financial leases	$ 1 900 000 000	$ 1 210 153 223	$ 1 162 052 552	$ 1 113 951 882	$ 1 065 851 211
Amortizations	$ 1 968 000 000	$ 3 619 050 243	$ 2 803 619 925	$ 1 993 716 341	$ 1 436 721 442
Total financial Debt	$ 13 386 203 465	$ 14 253 315 789	$ 14 887 892 950	$ 16 595 782 381	$ 19 271 645 241
Total financial leases	$ 2 273 000 000	$ 1 785 000 000	$ 1 210 153 223	$ 1 162 052 552	$ 1 113 951 882
Total short term financial debt and leases	$ 3 207 203 465	$ 3 120 366 032	$ 1 783 716 341	$ 1 237 221 442	$ 1 101 705 073
Total Long term financial debt and leases	$ 12 452 000 000	$ 12 917 949 757	$ 14 314 329 832	$ 16 520 613 491	$ 19 283 892 049
Total interests paid	$ 666 365 833	$ 745 909 396	$ 775 985 245	$ 831 058 772	$ 913 794 669

Compiled by author

Annex F

Table 4

Capital expenditures attributable by segment for each forecasted year

Capital expenditures attributable by segment		
Solar energy assets segment	$	107 084 579,82
Property, plant and equipment segment	$	4 507 546 913,24
Intangible Assets	$	14 277 943,98
Inventory	$	602 529 235,79

Compiled by the author

Annex G

Table 5

Working Capital map.

Working Capital	*2021*	*2022*	*2023*	*2024*	*2025*
Assets:					
Restricted cash	$ -	$ -	$ -	$ -	$ -
Accounts receivable, net	$ 1 055 286 726,54	$ 3 794 413 369,66	$ 4 555 107 798,42	$ 6 118 088 307,54	$ 7 472 226 816,90
Inventory	$ 4 459 927 434,01	$ 4 826 392 344,14	$ 5 200 553 017,38	$ 5 582 945 225,43	$ 5 973 750 062,06
Prepaid expends and other current assets	$ 1 346 000 000,00	$ 1 346 000 000,00	$ 1 346 000 000,00	$ 1 346 000 000,00	$ 1 346 000 000,00
Total necessities:	$ 6 861 214 160,55	$ 9 966 805 713,80	$ 11 101 660 815,79	$ 13 047 033 532,97	$ 14 791 976 878,96
Liabilities:					
Accounts payable	$ 8 057 022 564,05	$ 13 652 294 193,22	$ 16 927 772 991,32	$ 17 991 904 553,20	$ 19 986 411 201,51
Accrued liabilities and other	$ 4 669 474 881,97	$ 5 656 030 006,05	$ 6 851 022 060,94	$ 8 298 489 086,73	$ 10 051 773 371,93
Total resources:	$ 12 726 497 446,02	$ 19 308 324 199,27	$ 23 778 795 052,25	$ 26 290 393 639,94	$ 30 038 184 573,44
Working Capital	-5865283285	-9341518485	-12677134236	-13243360107	-15246207694
Working Capital Variation	-3292283285	-3476235200	-3335615751	-566225870,5	-2002847588

Compiled by the author

Annex H

Table 9

Tesla's Scenario Analysis.

Scenario Summary	*Very bad conditions*	*Bad conditions*	*Normal/Current Conditions*	*Good conditions*	*Great Conditions*
Changing Cells:					
US Tax Rate	35%	30%	25%	20%	15%
			50 000,00	$ 75 000,00	$ 100 000,00
			75 000,00	$ 100 000,00	$ 125 000,00
Bitcoin Target price end of the year2023	$ 45 000,00	$ 75 000,00	$ 100 000,00	$ 125 000,00	$ 150 000,00
Bitcoin Target price end of the year2024	$ 60 000,00	$ 10 000,00	$ 125 000,00	$ 150 000,00	$ 175 000,00
Bitcoin Target price end of the year2025	$ 75 000,00	$ 125 000,00	$ 150 000,00	$ 175 000,00	$ 200 000,00
Terminal worldwide GDP growth rate %	1,42%	1,92%	2,42%	2,92%	3,42%
Increasing % of delivered installed capacity	2%	5%	8%	11%	14%
Result Cells:					
NPV(WACC)	$ 182 897 745 075,71	$ 232 930 920 327,69	$ 292 982 537 270,72	$ 365 327 581 682,36	$ 453 025 960 905,89
Share Price, USD	$ 181,28	$ 235,97	$ 301,09	$ 379,02	$ 472,95

Compiled by author

Compiled by author

Annex I

Table 10

Independent variables.

US tax rate		25%
World GDP terminal growth rate		2,42%
Bitcoin Target price end of the year2021	$	50 000,00
Bitcoin Target price end of the year2022	$	75 000,00
Bitcoin Target price end of the year2023	$	100 000,00
Bitcoin Target price end of the year2024	$	125 000,00
Bitcoin Target price end of the year2025	$	150 000,00
Increasing % of delivered installed capacity		8%

Compiled by the author

Table 11

Dependent variables.

NPV(WACC) / Enterprise Value	$ 292 982 537 270,72
Share Price, USD	$ 301,09

Compiled by the author

Annex J

Table 12

Sensitivity analysis, Enterprise value forecast.

Percentiles:		*Forecast values*
0%	$	192 100 932 222,19
10%	$	249 924 742 903,43
20%	$	263 896 583 288,15
30%	$	274 410 418 357,01
40%	$	283 807 059 366,92
50%	$	292 933 682 071,79
60%	$	302 196 498 139,10
70%	$	312 318 767 595,42
80%	$	324 420 493 910,48
90%	$	341 283 145 064,50
100%	$	436 961 540 463,75

Compiled by the author

Table 13

Sensitivity analysis. Share price USD.

Percentiles:		*Forecast values*
0%	$	191,21
10%	$	253,98
20%	$	269,35
30%	$	280,83
40%	$	291,13
50%	$	301,12
60%	$	311,19
70%	$	322,20
80%	$	335,34
90%	$	353,52
100%	$	456,03

Compiled by the author