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Financial Valuation of Automotive Companies

MASTER´S DEGREE THESIS

MANAGEMENT ENGINEERING

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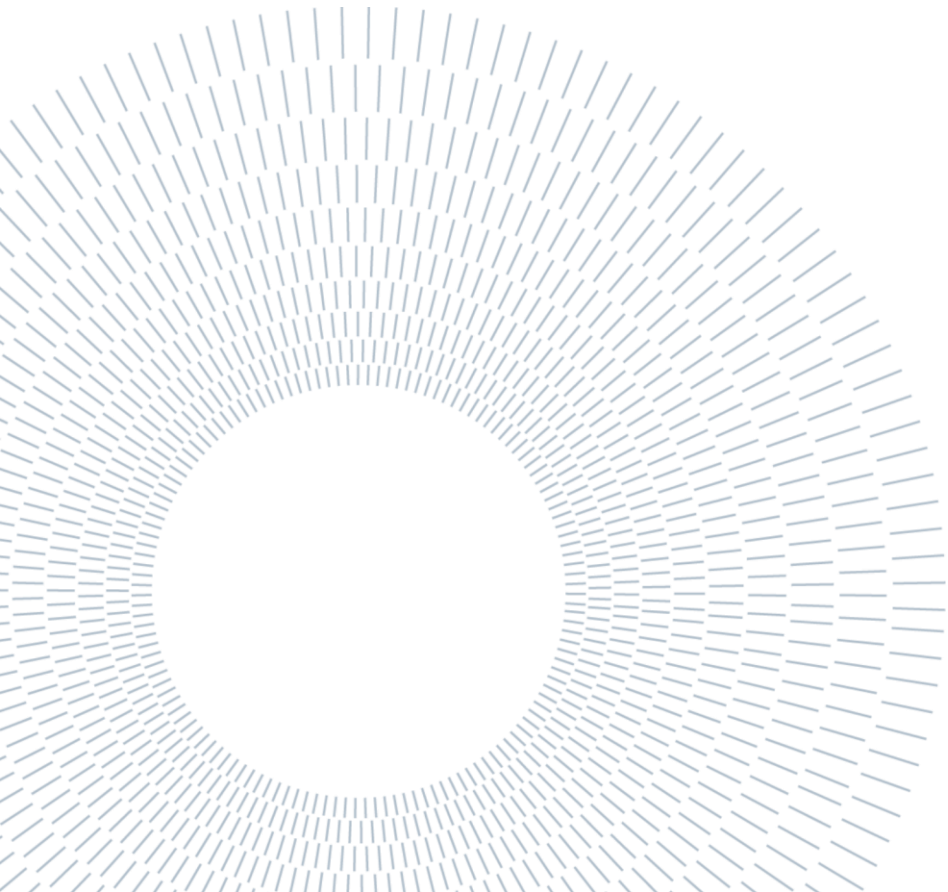
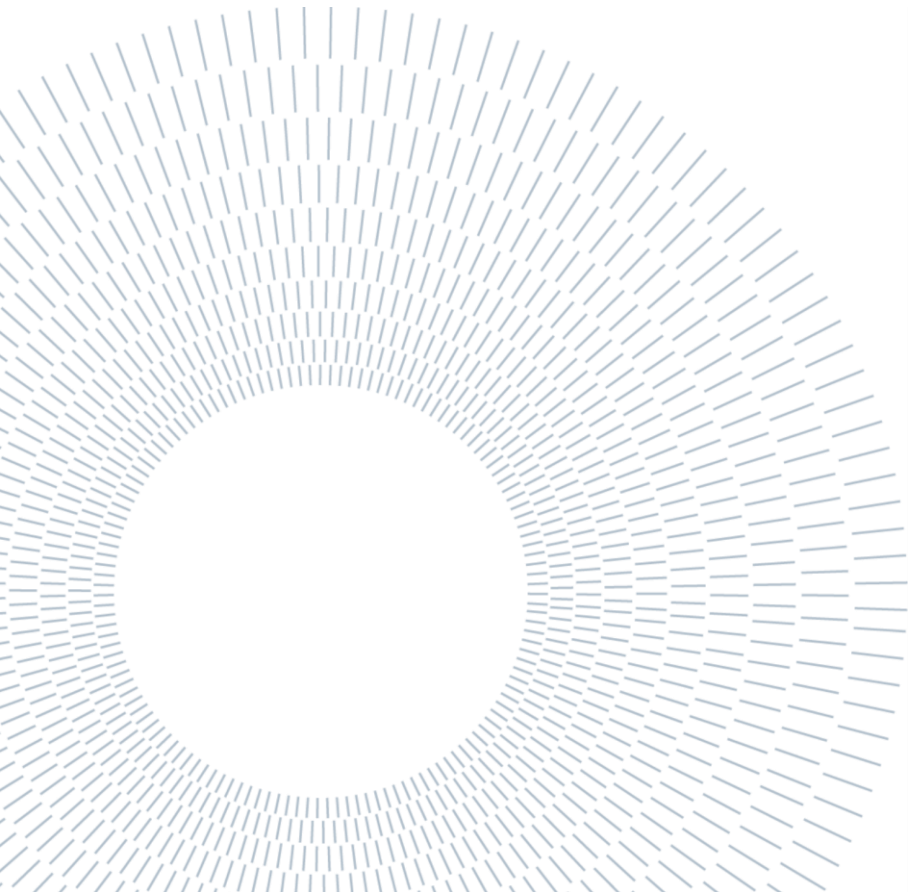


Abstract

The automotive industry is a wide sector that has such as historical importance and provides one of the most used mobility types. Inside such a big sector, there are a lot of innovations and technologies being adopted such as the vehicle´s electrification and automatization. These new trends in the sector promoted the insurgence of new companies and the changing of many incumbent companies. The companies analyzed are big players in the that are focused worldwide and in some of the main automotive markets such as USA and China. Based on these factors, the thesis will focus on some the 3 representative automotive firms: GM, Tesla and SAIC. In order to evaluate how these companies perform financially and understand if there is any market overvaluation, this thesis applies financial valuation method such as Discounted Cash Flows and relative valuation. Then, comparing the enterprise values obtained with the market value, it will give a better understanding on how the companies exploit the new technology trends to generate value and how the market perceives it on the final value.

Key-words: automotive industry, electric vehicles, market, growth, valuation, DCF.



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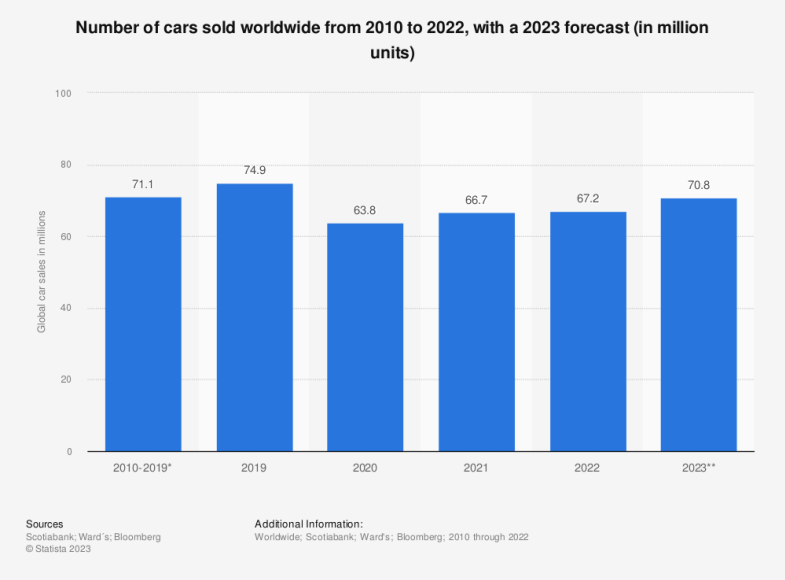
1. Introduction

The automotive sector consists in one of the main ways of transport for individuals, especially in growing cities for medium-short ranges. The sector has been one of the most important ones in terms of technological development, supply chain management and industrial revolution, impacting the society throughout the history. The sector is always exposed to the technological and industrial changes, many times being the first to implement significant changes such as IoT, manufacturing and production methods (Fordism and toyotism, for example) and newer trends such as electrical vehicles implementation and AI use for autonomous vehicles.

The sector´s market size is valuated in U$ 3.0 trillion, with an expected market growth of 2,5% in 2023. Only in 2022 the worldwide car sales were around 67,2 million automobiles, a growth of only 0,7% compared to 2020 approximately due to issues related to the shortage of microchips and a slowing economy contributed by the pandemic crisis and the Ukraine war disruptions in the supply chain. However, throughout the future years, especially from 2024, the sector will surpass its previous values from 2019.

Figure 1.1- Number of cars sold worldwide 2010-122



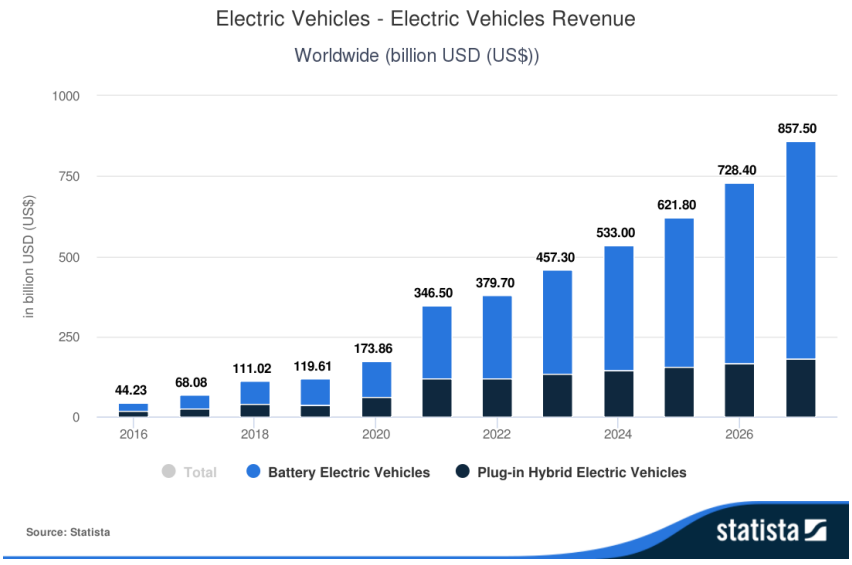
Source: (https://www.statista.com/statistics/200002/international-car-sales-since-1990/)

In 2022 the total automotive industry was valued at U$3,56 trillion and with an expected compound annual growth rate (CAGR) of 6,9% until 2030 (source). The

growth is especially higher in the Asia-Pacific zone, reporting an expecting CAGR of 7,4% in the same period due to the rise of income in middle class, growing population and the impact of major players that are in the area such as Toyota. In that market it is also registered as 5 main trends according to PricewaterhouseCoopers (Pwc) the electrification, automatization, sharing vehicles, connection with outside technologies and yearly automatization of models due to all of this major changes.

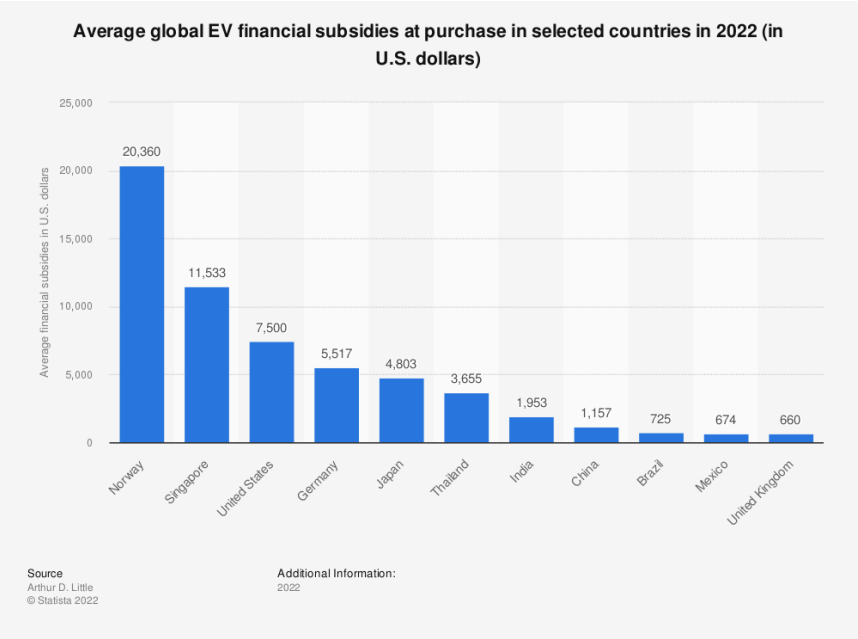
Regarding one of the biggest change in the automotive industry: the growing market for EVs (electrical vehicles), this market trend can be linked to the growing issue of the climate change and environmental issues related to the fossil combustion. The raising climate issue has made the EU (European Union) in 2022 to sign a deal on a law to ban the sale of new petrol and diesel cars from 2035 on EU countries [NUMBER 1], aiming to achieve its carbon neutrality by 2050. The growth of electric vehicles is expected to reach a revenue value of US$457.60bn in 2023 and a future CAGR (2023-2027) of 17.02%, which will reach a final value of approximately US$858,00 billion which can be seen in Figure 1.2, which consists in the majority of battery vehicles.

Figure 1.2- Electric Vehicles Revenue growth (Statista, 2023)



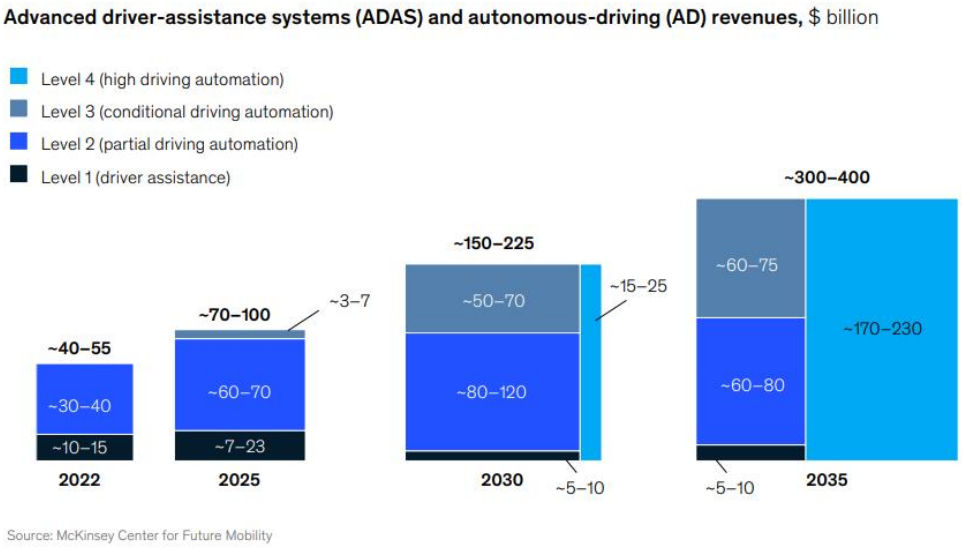
Some governments in the world are already conceiving financial incentives to the population to boost the market demand, such as giving a credit up to U$7500 by the American government to buy a new electric vehicle. Also there is an increasing subsides in European and Asian countries as shown in Figure 1.3, with a highlight especially to countries like Norway and Germany in Europe and Singapore and Japan in Asia.

Figure 1.3 - Average global EV financial subsidies at purchase in selected countries in 2022 (Little, 2022)



On the other hand, another greater factor that will generate impact in the automotive sector is the advance of the autonomous vehicles. According to Mckinsey, by 2035 the autonomous driving can create a market of U$300 billion to U$400 billion in revenue, with an increase of especially high driving and conditional driving automation as seen in Figure 1.4. These increases are linked to the fact that more customers are looking for higher levels of safety, as the use of autonomous vehicles reduce drastically the number of accidents and collisions, and they are seeking for more quality time, in other words, instead of spending their time while driving they can be doing new activities and being more productive. Lastly, some customers appreciate the possibility of using some new functions such as parking assistance that facilitate their daily life activities while driving.

Figure 1.4- Increase of revenue of driving assistance systems



With that said, the electrification and automation of the cars are going to leverage the growth in the industry and will model it in a completely different way than it was in the past. In an environment full of trends and future expectations about the values of the companies, it is possible that a lot of companies may have their current market valuation different from the future perspective and performance. Based on that, this thesis will pursue with a financial valuation analysis in some of the main companies, planning financial models to understand how the companies are generating their market value and try to understand if there is any overvaluation of these companies in this market sector. There are a lot of methodologies when applying the financial valuation models but the main ones that will be considered in this thesis will be relative valuations, which compare the value of the firm to other comparable enterprises and discounted future cash flows (DCFs), which consider the future cash generation to the investors of the company that can better predict the future value based on growth assumptions of the market and the company.

To perform a great valuation in this market, the main steps in this thesis will be the decision of impactful companies in the automotive industry that are historical relevant or pursue a higher value due to the adoption of new EVs technology, proceeding to a final modeling implementation using the methods as relative valuations and discounted future cash flows, then comparing the results with the market. This thesis, different from many other valuation reports, will provide an in-depth valuation of main enterprises that will represent huge players in the automotive field, which is a field with enormous market value. It will take in fact the countries and markets that the firms are located and a future perspective of impact that each company is proposing, providing a wider view of the sector's valuation instead of being specific in just one company as many other reports.

Concluding, the relevance of the automotive industry in the society is extremely related to the changes that this market is suffering with the electrification and increasing technology changes, which generates an increasing market growth. It is interesting to analyze in depth how each of some main companies can increase their growth, future market growth, produce innovations and how they plan on retaining this growth to generate value to their stakeholders. There are a lot of trends and valuation methods that can be done in depth to understand how well valued these firms are that will be explained in the next sections.

2. Equations and concepts

In this chapter it is mentioned the main concepts and eventual equations used for realizing the different methods of valuation.

2.1 Main concepts

The main valuation methods used in this thesis can be subdivided in 2 main ones: Relative Valuation and Discounted Cash Flows.

2.1.1 Relative valuation

Relative valuation consists in a method of valuating the company, such as equity, enterprise value and market capitalization, based on multiples from other companies that have the similar value drivers, geographical scope, market share and revenues size. The companies for that selection need to have their financial at public disclosure, which means that they need to be listed on a stock market. The number of the comparable companies usually range from a small number, usually 3 or 4 companies, a higher amount of companies may cause a misinformation.

The main multiples that can will be used for this industrial sector are going to be the multiples from EBITDA, from EBIT and sales

2.1.1.1 Multiple from EBITDA

The multiple from $EBITDA$, as $EV/EBITDA$ is widely used in industrial companies and it is the most popular one especially for financial investors. The value of EBITDA can be a good proxy for the company´s cash and it is a good comparison for car industries because due to their big asset value especially for fixed assets, the depreciations and amortizations and taxations can have different values especially depending on the country and on the different policies, not generating a precise indicator for the whole company enterprise value when discounted (which spreads the costs od fixed assets out for many years??). In the end the indicator gives a total return on the capital investments.

2.1.1.2 Multiple from revenue

Multiples from sales such as $EV/Revenue$ are usually the most generic ones, not considering profitability, cash or operational structure. It is not as precise as the others but it is useful when considering companies that have negative earnings, it can be a

good approach when dealing with startups that usually have a high spending and low cash generation since they are investing it for growth.

2.1.1.3 Multiple of Net Earnings (P/earnings)

Multiple of net earnings are very used among shareholders and equity investors, as they measure the final return of the company for the shareholders, which is the net profit compared to the total market capitalization. It is a multiple widely used especially when it is needed to evaluate the final Equity value of the company.

2.1.1.4 Unique Multiples

Many other unique multiples are developed trying to corelate the company´s value to some key driver of this value. One example of a multiple widely used for social media firms is the ratio between the EV and the number of active users, which are strictly related to the company revenue driver. This thesis will not focus in the use of these multiples since the automotive industry is already a consolidated industry with a wide variety of better multiple options.

2.1.2 Discounted cash flows (DCF)

The most used method and more descriptive is the Discounted cash flows (DCF) since it works on the available cash for firm or equity, that generates the enterprise or equity value, respectively. The method is composed of estimations of future cash flows and then discounting them by some rate, such as the cost of equity (K_E) or the weighted average cost of capital (WACC).

The method is the most descriptive one exactly because of the possible numerical estimations for each year. It will be the main method used in this thesis

2.2 Equations

This section provides some of the most useful equations that each different method used in the valuations:

2.2.1 Discounted cash flows (DCF)

To compute the Discounted cash flows to calculate the final enterprise value, it is needed to calculate the value of the free cash flows to firm (FCFF) that are calculated as:

$$FCFF = EBIT * (1 - t_c) + DA - \Delta NWC - CAPEX$$

The FCFF is the total free cash available to all the investors or the asset value of the company, including equity and debtholders. It starts with EBIT as it is the income generated from the company that will be direct to the investors, from this value it is also discounted the taxes. D&A is added back as it does not represent any cash slow, the variation of NWC is discounted as it represents outflows for the short-term financial condition of the firm. Also, capex is discounted because it is the cash used for investments in the firm´s assets. Then, the weighted average cost of capital (WACC), that is the rate used to discount the future FCFFs is computed as shown:

$$WACC = K_E * \frac{E}{D+E} + K_D * (1 - t_C) * \frac{D}{D+E}$$

Where K_E is called the cost of equity, K_D is the cost of Debt, E is the equity value and D is debt. An approximation that is going to be used in this rate value will be that its value will be constant throughout the future years, in other words there will not be a change in the capital structure. As there is a lack of available information, it is not possible to project the net debt issued, which would make the value of WACC varies on each year. Proceeding to the calculation of the cost of equity, it is given by:

$$K_E = \beta(r_m - r_f) + r_f$$

In the equation r_f is the risk-free return, which means the return of an investment with no default risk, usually it corresponds to a less treasury bond rated in the same currency area, r_m is the market return and β is a multiplier that indicates the share volatility compared to the market. In case of an unlisted company such as a startup β can be calculated by doing the calculation of the β unlevered for comparable companies:

$$\beta_u = \frac{\beta_L}{1 + (1 - t_C)(\frac{D}{E})}$$

Once calculated all the β_u for the companies, the average result is used to calculate the β_L for the specific company and then used in the equation **(number for Ke)**.

Also, since it is not possible to estimate all the values of future cash flows precisely and they start to impact each time less the final value (because of the discount by the rates), it is estimated the last value for a future cash flow, called Terminal Value (*TV*). In this thesis, the approach will be considering a net perpetual growth rate factor (*g*), so TV can be written as:

$$TV = \frac{FCFF_T * (1+g)}{(WACC - g)}$$

Finally, the enterprise value of the company is calculated by:

$$EV = (\sum_{t=0}^{T-1} \frac{FCFF_t}{(1+WACC)^t}) + \frac{TV}{(1+WACC)^T}$$

Once calculated the enterprise value (EV) it is possible to obtain the equity value of the company by doing:

$$EV = E + D - Cash\ \&\ Cash\ equivalents$$

Where D is the company´s total debt, this approach will be used instead of the calculation of the FCFE (Free Cash Flows to Equity) because in order to calculate those cash flows more estimations will be used and the final value obtained for the equity may be inaccurate.

2.3 Exchange rate for currencies

To avoid misleading results with different currencies, the currency used throughout this whole document will be the american dollars (USD), the exchange rate for eventual other currencies will be the average 2022 exchange rate, which is specified in the Table X.

Table 2.1- Currencies exchange rates to USD

Currency	Exchange rate to American Dollar (USD)
Japanese Yen (¥)	131,50 (0,0076)
Euro (€)	1,054

Chinese Yuan (RMB)	0,149
Hong Kong Dollar (HKD)	0,128
South Koren Won (KRW)	0,0008

Sources -

2.4 Bibliography and citations

list of references is placed at the end of the manuscript after the chapter containing the conclusions. We suggest using *Mendeley* integrated in Word.

Here is how you cite bibliography entries: [2], or multiple ones at once: [3, 5].

The bibliography and list of references are generated automatically by running *Mendeley.*

3. Selection of companies

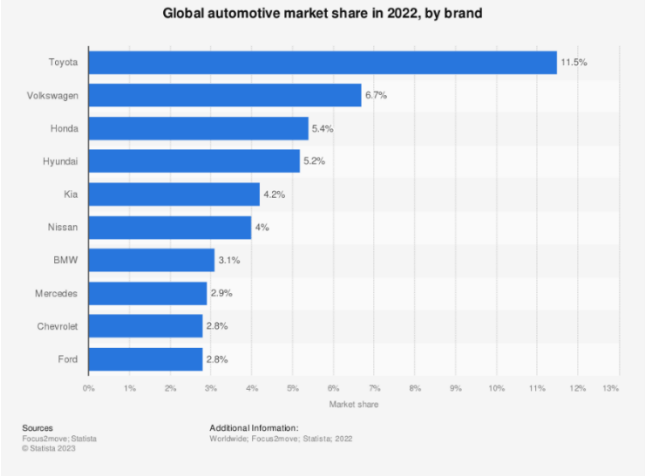
In order to proceed with the valuation method, first it is needed to select the main companies that will be analyzed throughout this whole thesis. The research in the automotive market has shown a lot of trends, which the main ones will be the growth of Electric Vehicles and the adoption of AI vehicles. To do a fair valuation of representative companies in the sector, 3 main firms will be selected to the valuation analysis that represent big players now or in the future. This selection also considers companies that are acting in representative markets locations and that are adopting the use of new technologies.

Thus, the companies that will be selected will be one incumbent company that has been on the market for such a long time, so it is possible to understand how this company is changing, remaining competitive in the market and mainly how is it providing new value for the stakeholders. Also, a company that has disrupted the market with the use of new technologies such as AI and the mass electrification of their vehicles, which is representative to understand how the full adoption of this new technologies provide future growth and value. Lastly a company that is focused in one of the most growing markets, China which is a greater representative of the worldwide future automotive car competition.

3.1 Selection of the incumbent company

As explained before, to make an impactful valuation, the company chosen to valuate is an incumbent, that it is in the market for a longer time and owns a considerable market share of the automotive industry. To evaluate the impact of a historical player on its current value, the decision is to evaluate General Motors Company (GM), especially because of the longer historical presence in the automotive industry since 1908. It is interesting to analyze how such a big historical player like GM can manage to generate future value. **According to Figure X,** the company is still at a top rank of players in the global automotive market but lost a lot of the market share throughout the years (**source**).

Figure 3.1- Global automotive market share



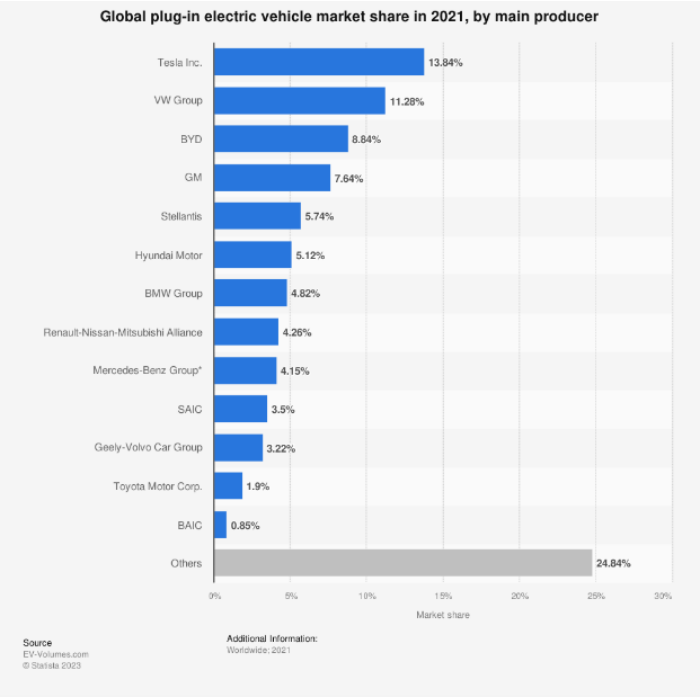
Source: https://www.statista.com/statistics/316786/global-market-share-of-the-leading-automakers/

GM tries to maintain their position by constantly adopting new technologies and changing it is manufacturing capacity. Nowadays, to increase the growth and market share, GM is providing innovations and further diversification by investing $35 billion through 2025 in electric and autonomous vehicles (source). Also, the sales of GM are focused each time more in the production of EVs as the company targets an ambitious goal of selling U$50 billion in 3 years, trying to surpass the main competitor Ford (source) and gaining market share from the main player Tesla. In that way, GM valuation will provide an interesting insight on how a historical player can position and generate value on the market.

3.2 Selection of Electric Vehicle company manufacturer

Another company chosen for the analysis is one of the first that innovated the automotive market with the creation of autonomous vehicles and the implementation of EVs, Tesla. The firm is the biggest producer of EVs in the world and was the first to implement them in production scale with the first model released in 2008. According to **Figure X**, the firm owns the biggest market share of plug-in vehicles and it is a representative company focused in new technologies for vehicles.

Figure 3.2- EVs market share



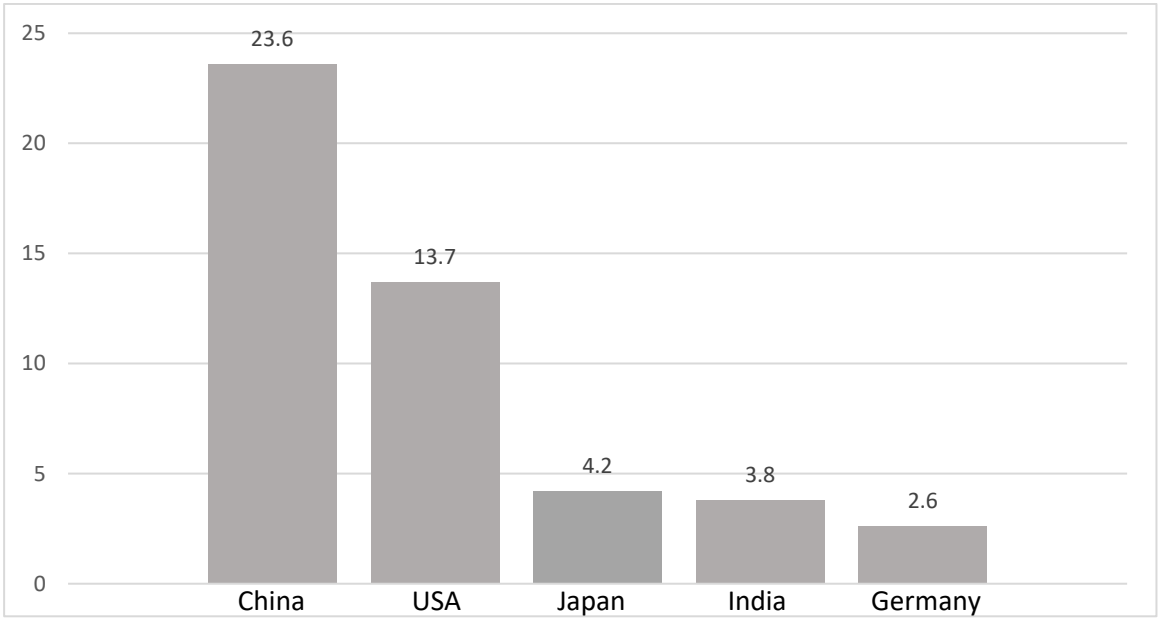
SOURCE: EV-Volumes.com. (March 7, 2022). Global plug-in electric vehicle market share in 2021, by main producer [Graph]. In Statista. Retrieved April 11, 2023, from https://www.statista.com/statistics/541390/global-sales-of-plug-in-electric-vehicle-manufacturers/

The growth perspective of being a pioneer in the use of new technology in a competitive market such as the automotive market, made the company grow their revenue size at large steps of 30% up to 80% source. It is a different growth perspective that must be analyzed in a specific way to understand exactly how the stakeholders see the company generating value in the next years, with a structure that is very different from an incumbent company such as GM that was focused in the past in the production of fossil combustion vehicles and already had a market competitive advantage.

3.3 Selection of Chinese company

Lastly, it is interesting to valuate and compare all these firms with a growing company that is focused more in China, one of the main markets in the world, as it can be seen in **TABLE X,** totalizing approximately 23,6 million cars sold. Also, the chinese automotive market is getting more competitive worldwide as it became the 2nd country in the world in terms of exported cars, exporting 2,5 million cars in 2022 according to China Passenger Car Association.

Figure 3.3- Cars sold by country in 2022.



Source- https://www.factorywarrantylist.com/car-sales-by-country.html

The market has several relevant companies that are expanding and growing to many countries, in that context it is interest to analyze one of the biggest chine car manufacturers, Shangai Automotive Industry Corporation (SAIC Motor). The firm is one of the biggest players in China, which has been in the market since the 70s, with a total of 5,37 million cars sold in 2021. The company sells automotives by many different brands such as Roewe, Baojunm, MG, IM and by other joint ventures with GM and Volkswagen. Also, as the production of electric vehicles is a key point to the future market growth, it is important to highlight that the company is expanding the electric vehicles production through diverse investments, such as a joint venture with GM to build their second EV plant in China **(source)**.

After the selection of all of the relevant players in the market, there is a good overview on main companies that are at the center of the automobile market, by being great players in many regions and for being ahead of many trends that are happening in the industry, such as the electrification of the vehicles. So, the valuation method will proceed with the first method, consisting in the relative valuation.

4. Relative Valuation method

The first approach to evaluate the companies will be made by using the relative valuation method since the method is one of the most common and simple to obtain the answer for the value or range of values of the companies. Therefore, the method will be divided in first choosing the main comparable companies for each enterprise analyzed, as this is the most important part of the method. After that, the choice of best multiples and finally the calculation to achieve the final value of the company.

4.1 Comparable companies

According to Damodaraan, a comparable company is a company with cash flows, growth potential, and risk similar to the firm being valued. Thus it is not necessary that the comparable firms must be in the same sector or industry but usually firms in the same sector tend to have the same characteristics said. Based on that the companies chosen may not be on the automotive sector, depending on what is the main value driver for its revenues and growth increase.

Some of the main criteria to do find the most comparable companies composes at first by analysis of some main financial data. The most relevant one is the revenue size since the revenue is a good estimator of the firm´s size and especially when combined with the growth, has a direct correlation with the cash flows generated. Also, the cash and cash equivalents provide a view into the available cash flows. The debt structure measured in terms of ratio between Debt and Equity ratio is a main indicator of how the risk of the company is diversified among banks and sh**areholders**. Finally, the geographical scope demonstrates to which governments, legislations and markets the risk is concentrated.

4.1.1 GM

To begin the main financial data from General Motors, first structuring the cash flows, revenues growth and geographical scope. In the TABLE X, there is also the addition of the automotive free cash flow, which is a great parameter to measure the liquidity of the automotive sector from GM. All the indicators reunited provide a great background of the firm growth potential, cash flow structure and risk.

Table 4.1- Main financial data from GM (U$ billion)

Revenue	Revenue growth	EBITDA	Cash and cash equivalents	Automotive FCF	Debt structure (D/E)	Geographical scope
156,74	23,4%	21,60	21,95	9,7	114,70/71,93=1,59	Global

Source-

The selection of comparable companies will be companies that present high revenues, high growth perspective and global presence since it will indicate that the comparable firms will be exposed to the same risks related when dealing globally with different countries. Reminding that the revenue driver of GM is based on sales of new vehicles, at first, will be selected the biggest automotive companies based on the revenue size, the main global automotive companies that can represent great comparable firms are the follow:

Table 4.2- Possible comparable firms for GM valuation

Comparable firms	Revenue (U$ billion)	Revenue growth	EBITDA	Cash and cash equivalents (U$ billion)	FCF	Debt structure (D/E)
Toyota	238,63	15,3%	36,21	46,49	1,81	212,83/206,37=1,03
Volkswagen AG	294,31	11,6%	50,58	31,34	6,11	231,14/173,07=1,33
Stellantis	189,28	20,2%	29,24	48,71	11,34	28,48/76,29= 0,37
Mercedes-Benz	158,1	12,0%	31,21	18,63	14,14	117,87/91,21= 1,29
Ford Motor	149,98	18,9%	12,77	25,34	-0,13	2,05 (including the ford credit)
Honda	110,67	10,5%	13,19	27,94	11,37	0,80 (65,56 debt)
Hyundai	114,02	21,2%	12,07	16,69	5,29	90,63/72,712=1,26

To avoid imprecision due to a high number of comparable firms used to calculate the valuation, the method will select only 6 companies. All the firms rely on the same revenue drivers as automotive sales and no bigger differences seem to have a greater impact. Toyota and Volkswagen as the top players in the automotive sector represent a great approach, with similar debt to equity proportion, large revenue size and steady growth, with proportional cash generations. Ford is one of the historical competitors to GM with greater influence in the USA market, such as GM, serving as a great comparable firm, providing similar financial indicators. Hyundai and Mercedes also as a worldwide player have similar financial indicators as GM, both have their revenue drivers related to the sale of new cars, even if Mercedes focuses more in the upper-class customers, the revenue driver and financial structure is still very similar to GM.

Some differences are seen in the debt-to-equity ratio especially for Stellantis, which is considerably lower than GM both in terms of proportional and in terms of total debt used, so this may diverge from the debt structure from GM, making Stellantis a company less exposed to financial leverage and default risks. Thus, Stellantis will not be considered as a comparable firm for GM.

In conclusion, all the firms exposed besides Stellantis provide similar financial indicators that are strong to point similar cash flows, risk structure and growth potential. In the end, the final comparable firms will be:

- Toyota,
- Volkswagen AG,
- Mercedes- Benz,
- Ford Motor,
- Honda,
- Hyundai.

4.1.2 Tesla

To begin the analysis, looking at Tesla´s main financial results according to the Table X, the company has a big revenue growth and especially a low debt when compared to the equity size. This is explained especially due to the high rounds of equity funding due to a high value perceived. Also, Tesla main revenue driver consists in automotive sales and considering the cost of production of EVs is yet considerably higher when compared to fossil vehicles, Tesla is targeting mainly the “premium” or middle segment of customers.

Table 4.3- Tesla main financial results (U$ billion)

Revenue	Revenue growth	EBITDA	Cash and cash equivalents	Free Cash Flow	Debt structure (D/E)	Geographical scope
81,46	51%	19,19	22,18	7,6	2,04/44,7= 0,045	Global

Source- https://digitalassets.tesla.com/tesla-contents/image/upload/IR/TSLA-Q4-2022-Update

Comparable companies for the relative analysis will be companies which revenues come from especially from EV sales and are focused on worldwide expansion at a higher growth rate. Many reports (source) also consider that auto companies that target the high or medium segment are great comparable firms as their revenue driver focus in the same customers as Tesla. Some of the main comparable firms and some financial indicators can be seen in Table X.

Table 4.4- Possible comparable firms

Comparable firms	Revenue (U$ billion)	Revenue growth	EBITDA	Cash and cash equivalents (U$ billion)	FCFF	Debt structure (D/E)
BYD	61,41	86%	5,90	7,396	6,47	4,06/17,44=0,23
Toyota	238,63	15,3%	36,21	46,49	1,81	212,83/206,37=1,03
Nissan	80,58	25,7%	3,79	15,32	-2,10	6,251/5,328*=1,17
Hyundai	114,02	21,2%	12,07	16,69	5,29	90,63/72,712=1,26
Audi	65,14	16,4%	9,15	10,12	-	1,59/33,29=0,047
Li Auto	6,565	67,7%	-52,75	5,86	-	1,39/6,5=0,214
Porsche AG	31,95	22,6%	7,38	0,037	-	1,357/5,649=0,24

BMW	150,31	28,2%	34,28	16,87	15,25	88,25/79,19=1,11
Nio Inc.	7,34	36,3%	-2,11	5,82	-1,61	3,53/4,12=0,85
XPEV	4,00	27,9%	-1,13	2,17	-1,92	1,65/5,50=0,3

Sources-

From all the listed companies, one of the main criteria to choose the companies are the debt composition that is widely different in car manufacturers, especially for bigger companies that suffer from increasing the financial liabilities changing their risk composition. Hyundai represents the highest debt to equity ratio in the list, proportionating an increased financial leverage, which considerably impacts the financial risk that the company is exposed. Also, Hyundai is not considered as a company that is highly investing in the EVs, so considering all of that, Hyundai will not be considered in a further analysis. Another company that cannot be considered as a comparable company is Nissan because it has negative free cash flows, lower profitability margin than Tesla and higher debt to equity structure.

A lot of companies such as Li Auto, Nio Inc and XPEV represent negative profitability values as these companies are still at their initial production stages and spending a lot of money on new investments to increase future productivity. Also their revenue sizes are considerably lower than Tesla, so these companies will be discarded for future relative valuations. Besides that, the other companies have similar revenue drivers and similar revenue size, cash flows and risk structure. In the end the comparable firms will be:

- BYD
- Toyota
- Audi
- Porsche AG
- BMW

4.1.3 SAIC

Adopting the same methodology for SAIC, the **table X** shows some of the most important financial results for further comparison with other competitors. The negative growth in revenue is still due to issues related to the pandemic that still blocked the car production in China and keep the revenue at a value lower than the pre pandemic phase.

Table 4.5- SAIC main financial results (U$ billion)

Revenue	Revenue growth	EBITDA	Cash and cash equivalents	Free Cash Flow	Debt structure (D/E)	Geographical scope
110,08	-4,59%	3,73	23,12	0,48	47,71/50,11=0,95	China

Source- https://www.wsj.com/market-data/quotes/CN/600104/financials

The main possible comparable firms are mainly acting in the chinese market, they are shown in the **Table X** with the respective financial indicators.

Table 4.6- Possible comparable firms to SAIC motor (U$ billion)

Comparable firms	Revenue	Revenue growth	EBITDA	Cash and cash equivalents	FCF	Debt structure (D/E)
Donfeng Motor Company	13,81	18,12%	-0,72	10,06	2,22	11/22,27=0,49
Changan Automobile	17,45	15,8%	1,67	7,97	0,89	3,64/9,38=0,39
Weichai diesel engine factory	26,00	-23,17%	2,15	10,18	-1,24	11,34/14,96=0,76
BAIC Group	28,35	4,47%	5,07	5,43	2,26	2,96/11,34=0,26
BYD	61,41	86%	5,90	7,396	6,47	4,06/17,44=0,23
GAC	16,39	45,36%	0,003	5,10	-0,09	3,03/18,22=0,17

Geely	22,02	40,5%	1,37	4,87	1,99	2,38/10,46= 0,23
FAW	4,87	Decrease?				

Source-

From the list of some of the main companies in the Chinese market, it is going to be selected 5 firms to proceed with the analysis, such as in the previous selections. Donfeng Motor Company doesn't represent one of the main players in the market in terms of revenue and shows a negative EBITDA, which would be impossible to use because of the further use of EBITDA multiples. GAC represents a same issue, due to such a low value for EBITDA, making the use of a multiple very inaccurate. BYD can be a great comparable since it is second placed in the chinese auto market, has a low debt to equity ratio, growth at a considerable pace. Even if the other companies don't have the same revenue and cash size, in the chinese market these companies represent the nearest competitors to SAIC and so the best approachable companies in terms of comparables. The enterprises in general have a similar value for the other financial indicators, indicating a similar cash flow and growth structure. The final firms chosen were:

- Changan Automobile
- Weichai diesel engine factory
- BAIC Group
- BYD
- Geely

4.2 Calculation of final values

After electing the best comparable companies, the computation of the company´s final enterprise value will be reached by doing the median value of EV/EBITDA from all the companies. The use of an EBITDA multiple is as explained before a way of approximating the value for industrial companies, due to the high capital investments and the different values of depreciations and amortizations considered on the companies. So in next steps, it will be computed the value of Enterprise Value for each comparable than it will be taken the average of EV/EBITDA.

4.2.1 GM

From the 6 final comparable companies, the **Table X** shows each of the multiple results and the final average:

Table 4.7- Final multiples result for Toyota comparable companies.

Comparable firms	EV	EBITDA	EV/EBITDA
Toyota	342,86	36,21	9,47
Volkswagen AG	198,89	50,58	3,93
Mercedes- Benz	126,13	31,21	4,04
Honda	69,36	13,19	5,25
Ford Motor	141,6	12,77	11,09
Hyundai	100,45	12,07	8,32
Median	-	-	6,79

Source- Toyota 31/12/2022

The final median number from the companies chosen was 6,79. As GM´s EBITDA value was US$ 21,6 billion, the final enterprise value was estimated in US$146,7 billion. This result will further be discussed using also the DCF value as a comparison.

4.2.2 Tesla

The value of the EBITDA multiple for the 5 comparable firms in Tesla´s case is given by the Table X.

Table 4.8- Tesla comparable firms multiples

Comparable firms	EV	EBITDA	EV/EBITDA
BYD	75,61	5,90	12,82
Audi	63,76	9,15	6,97
Porsche AG	97,05	6,936	13,99

BMW	123,78	34,28	3,6
Toyota	342,86	36,21	9,47
Median	-	-	9,47

Source-

The final median EBITDA multiple value was 9,47, using the EBITDA value of 19,19 billion USD, which will lead as a final enterprise value of U$181,73 billion.

4.2.3 SAIC

For SAIC, the multiple values for the EBITDA multiples are given as shown in **Table X.**

Table 4.9- Final EBITDA multiple value for SAIC.

Comparable firms	EV	EBITDA	EV/EBITDA
Changan Automobile	7,96	1,67	4,77
Weichai diesel engine factory	10,15	2,15	4,72
BAIC Group	-0,33	5,07	-0,06
BYD	75,61	5,90	12,82
Geely	9,23	1,37	6,74
Median	-	-	5,73

Source-

After considering all the enterprise values, BAIC group presented a negative, especially due to a considerable cash and cash equivalents quantity. To make a better approach to the final multiple, BAIC group was discarded for the calculation. Thus, the final multiple value achieved was the median value of 5,73 and, as the value of SAIC´s EBITDA was 3,73, the final enterprise value obtained was U$21,3 billion.

5. DCF method

The DCF method consists on the most complex method of the valuation methods since it requires more assumptions and methods to project future cash flows available for the firm or the shareholders. The result is more accurate, since it estimates all the future cash flows that the company will produce and when combined with the relative valuation will provide a great perspective of the final value.

To begin the analysis, for each company it will be estimated the growth of revenues, one of the main factors for predicting the final cash flows available, then other estimated growths such as net income, capital expenditure, depreciation and amortization and net working capital. Then, calculating the effective free cash flows to firm and the terminal values, all the available cash flows will be discounted by the effective WACC rate. The horizon for future cash projections will be 5 years to not make it inaccurate.

5.1 Estimation of future cash flows

For each company, it was estimated the growth for the main valuation metrics when estimating the Free cash flows to firm, by comparing the growth with historical data, market future growth and comparison with other competitors. Several adaptations are made to better adequate the macroeconomic perspective where the company is inserted and based on the availability of information for future projections. All the estimations and hypotheses will presume conservative scenarios since the final value for the enterprise value should not be overvalued based on unfeasible assumptions.

5.1.1 GM

5.1.1.1 Revenue growth

The future revenue growth is one of the most important steps of the future cash flow generation, since it is one of the main factors that may imply in the company growth. The composition of GM´s revenue is concentrated approximately 90% in the North America (U$128,38 billion) (source) and so the main driver of an analysis should be the future growth of the North America automotive market, especially in USA. The North America market is expected to grow until 2028 with a CAGR (continuous growth rate) of 6,63% until 2028 (source). In order to make the conservative analysis as GM is a strong player in the north America, a great approach for the future revenue

growth is going to be the same as the market growth. That way the future revenue projection is presented in **Table X**.

Table 5.1- Future projection of GM revenue

Year	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Revenue	156.735	167.126,5	178.207,0	190.022,1	202.620,6	216.054,3

5.1.1.2 Costs and expenses

The GM´s cost and expenses is going to be estimated based on the margin of sales, as this parameter can be related to the revenue size of the company. The historical values in the last 5 years of the cost and expenses and margins are shown in the **Table X**.

Table 5.2- Historical costs and expenses margins (U$ million)

Year	**2018**	**2019**	**2020**	**2021**	**2022**
Costs and expenses	142.604	131.756	115.851	117.680	146.421
Margin	97%	96%	94,6%	92,7%	93,4%

The results show that the margin does not vary very much throughout the years, in fact the margin is keeping stable with an average value of 94,73%. When compared to another big competitor such as Ford, the last margin for the last 3 years is shown in **Table X** with an average value of 92,24% and seems really similar for a future cost and expense projection for GM.

Table 5.3- Historical costs and expenses margin for Ford Motor co (U$ million)

Year	**2020**	**2021**	**2022**
Costs and expenses	116.951	126.566	145.285
Margin	91,98%	92,83%	91,91%

Source-

5.1.1.3 Assets and Depreciation projection

The D&A is also another key factor to estimate the future free cash flows to firm. The value of the depreciation is certainly related to the value of the property and equipment, the main assets that will suffer a depreciation impact. In that way, the D&A will be calculated as a percentage of the total Property and equipment, so the first step will be the estimation of future growth of those assets. The historical data shows that the main assets that are exposed to the D&A are split into 2 main types, property and equipment on operating leases, the division of their values is shown in the **Table X.**

Table 5.4- GM Property and equipment growth (U$ million)

Year	2018	2019	2020	2021	2022
Property	38.758	38.750	37.632	41.115	45.248
Yearly growth	-	0%	-3%	9%	10%
Equipment on operating leases	43.559	42.055	39.819	37.929	32.701
Yearly growth	-	-3%	-5%	-5%	-14%

The results show a explicit relation telling that the values of property are each time more growing and the equipment on operating leases reducing, except for the initial pandemic phase in 2020. That way, it is possible to divide the growth of each part individually considering the average growth in the last years. The average growth of property, disregarding the 2020 decrease, since the first pandemic year probably resulted in a downsizing of the property because of the higher costs of maintenance, it is obtained a value of 6,43% while the value for the equipment were on average decreasing at a rate of 6,82%. Projecting the total value of the assets the value obtained is displayed in **Table X.**

Table 5.5- Future Property and Equipment values

Year	2023	2024	2025	2026	2027

Property	48.157	51.253	54.548	58.055	61.787
Equipment on operating leases	30.469	28.389	26.452	24.646	22.964
Total	78.626	79.642	81.000	82.701	84.752

After the estimation of these values, the D&A values will be calculated as a percentage of the total value of property and equipment. Based on that, the D&A percentages for the last years are shown in the **Table X**.

Table 5.6- D&A percentage of Property and Equipment

Year	**2018**	**2019**	**2020**	**2021**	**2022**
Property and Equipment	13.669	14.118	12.815	12.051	11.290
D&A	82.317	80.805	77.451	79.044	77.949
Percentage	16,61%	17,47%	16,55%	15,25%	14,48%

The results show that the D&A percentage is decreasing through the last years, due to the reduction of equipment in operating leasing. In that way, to estimate the future D&A rate, the value considered will be the average from the last 3 years, since the composition of assets in the company is changing considerably when related to 5 years ago, as analyzed before. Thus, the final ratio of D&A to equipment and property will be 15,43% and the future values are shown in **the Table X.**

Table 5.7- Future D&A projection (U$ billion)

Year	2023	2024	2025	2026	2027
Property and Equipment	78.626	79.642	81.000	82.701	84.752
D&A	12.128	12.285	12.494	12.756	13.073

5.1.1.4 Net Working Capital

The changes in working capital can be very unstable and depend on the way that the company may be managing some of the current assets and liabilities. To ensure that the projections are not the result of an unusual base year, you should tie the changes in working capital to expected changes in revenues or costs of goods sold at the firm over time **(Damodaran)**. Therefore, the estimation of **NWC** was done by using margin values from the revenue, the last 5 years NWC and margin are shown in **Table X.**

Table 5.8- NWC and margin last 5 years values (U$ billion)

Year	2018	2019	2020	2021	2022
NWC	-5,932	-3,823	-1,658	-9	1,213
Margin	-4,03%	-2,79%	-1,35%	-0,01%	0,77%

By looking at the results, it is possible to notice that the NWC margin is growing on average 1,2% over the last years, so a future projection would be by increasing the future NWC margins by 1,2 as well. However, increasing the NWC margin steadily for the next 5 years might increase the NWC to a higher value that wouldn't make much sense for a big company as GM, since the company may not be efficient enough to keep increasing its inventories and receivables forever. So the final NWC margin will be kept as 3%, a more conservative approach since the company never achieved higher levels like this. The final values are shown in the **Table X.**

Table 5.9- Future GM NWC projection (U$ billion)

Year	2023	2024	2025	2026	2027

NWC	4.607	5.346	5.700	6.078	6.481

5.1.2 Tesla

5.1.2.1 Revenue growth

Tesla´s main segments are composed by 3 major areas, automotive (including automotive sales and leasing), energy and other services (including the superchargers services, insurance and full self drive). The main areas that provide the revenue consist in the automotive sales, energy generation and storage, automotive leasing and regulation and services and other. In 2022, almost 83% of the total revenue came from the automotive sales, so to guarantee a better analysis it will be looked more in details the revenue drivers and projections of this segments while for the others the analysis will be more simplified since their value will generate a lower impact in the final value.

So, beginning with the automotive sales, the drivers of revenue are the price of each car model and the number of vehicles that are being sold. Tesla´s main car models are the model 3, model Y which are the firm´s most accessible cars to the public, model X and model Y are more expensive models focused in the higher segment. There is also the launch of trucks such as the Cybertruck and Tesla Semi truck which is on pilot test production and the tesla roadster, the company´s sportive model and currently the biggest estimated price. As the Semi truck is still on a pilot project without an specific launch date and no future news about the Roadster´s launch date, it will be only considered the future production perspective of the Cybertruck, which is projected to be on sale by the end of 2023 (**source**). The Table X computes the average price for every model.

Table 5.10- Average Tesla price per model (U$)

Model	**Price/unit**
Model 3	46.000
Model Y	60.000

Model S	80.000
Model X	95.000
CyberTruck	55.000

Source-

The units of each model sold throughout the past 4 years are shown also in the **Table X**, representing an increase especially in the models 3 and Y, the models that are for the medium segment. Also, the models 3 and Y are sold a higher proportion when compared to the model X and model S, which will be considered to the future projection.

Table 5.11- Tesla historical units and revenue

Year	**2019**	**2020**	**2021**	**2022**
Units sold Model 3 and Model Y	300.885	442.562	911.242	1.247.146
Increase	-	47%	106%	37%
Units sold Model X and Model S	66.771	57.085	24.980	66.705
Increase	-	-15%	-56%	167%
Total Revenue (U$ million)	19.952	26.184	44.125	67.210

Source-

To project the future growth of revenue, the value of the future growth in units, using a conservative approach, will not be considering only an average of the past values due to the aggressive increase which probably will not be maintained in the next years. Thus, the value for the increase of models 3 and Y will be at 30% in the next near years and 20% for the last ones whereas for the models S and X the rate considered will be 20% and then 10%, at a lower rate because of the future view perspective of Tesla of focusing on their base models and making them more accessible (**Source**). For CyberTruck the projection beginning from 2024 when it is going to be more available for the customers its going to be at a similar rate of 30% a year with an estimation of

units sold of 30.000 in the beginning, since there will not be enough factories to produce this model at a higher scale, currently Tesla only disclosed the Gigafactory of Texas to produce this model. The growth rates even if considered at a high value can be justified because of the future increase of EVs that, for example, have been growing at rates of 40% a year since 2016 in the US market (**source**) and the leading position of Tesla in this market.

As there is a lack of data for specific units sold for each vehicles the estimation of the price for unit for model 3 and Y will be calculated as only one value, considered as a weighted average of both prices, considering that model 3 is part of 65% of total units and model Y the rest, which results in a final value of 50.900 U$. For models S and X it is considered as the simple average between the prices, 87.500 U$. Also, it is very important to consider the decrease in the final price of the vehicle for the model 3, because of the future accessibility of the vehicle for lower customers. Thus, the model 3´s price is going to vary at a small decreasing rate of 3% each year, the same perspective it is not possible to be inferred in the other car models due to the lack of information and the higher price of the models, that are currently targeting the higher segments. The final revenue for the automotive sales in the next years are shown in the **Table X.**

Table 5.12**-** Tesla projection of automotive sales in next years

Year	2023	2024	2025	2026	2027
Units sold Model 3 and Model Y	1.621.290	2.107.677	2.739.980	3.287.976	3.945.571
Price/unit (U$)	50.900	50.000	49.110	48.210	47.310
Increase	30%	30%	30%	20%	20%
Units sold Model X and Model S	80.046	96.055	115.266	126.793	139.472
Price/unit (U$)	87.500	87.500	87.500	87.500	87.500
Increase	20%	20%	20%	10%	10%
Units sold CyberTruck	-	30.000	39.000	50.700	60.840

Price/unit (U$)	-	€ 55.000	€ 55.000	€ 55.000	€ 55.000
Increase	-	-	30%	30%	20%
Total Revenue (U$ million)	89.527	115.444	146.780	172.392	202.222

Considering the other Tesla´s revenue segments, the historical values and growth are shown in the **Table X.**

Table 5.13- Tesla historical units and revenue

Year	**2018**	**2019**	**2020**	**2021**	**2022**
Service/other	1.391	2.226	2.306	3.802	6.091
Increase	-	60%	4%	65%	60%
Energy storage and systems	1.555	1.531	1.994	2.789	3.909
increase	-	-2%	30%	40%	40%
Auto leasing and reg	883	869	1.052	3.107	4.252
increase	-	-2%	21%	195%	30%

For the service/other, the growth perspective is growing at a rate of 60%, so for the short term perspective this proportion will be used as a constant value and decreasing for the next years, as these services are not the main categories that tesla is investing. Regarding the energy storage and systems, it can be assumed an average growth of 30% for the next years, at a rate that is similar as the rate of growth of the auto vehicles revenue, because selling the energy storages, especially chargers and super chargers are strictly linked with the number of cars that are being sold. Lastly, auto leasing is a value that varies a lot during the past years, so the future projection is to keep the same rate of 30%, keeping the rate similar to the EVs that are being sold. The final revenue considering all the areas will be shown in the **Table X**.

Table 5.14- Tesla total revenue projections (U$ million)

Year	2023	2024	2025	2026	2027
Service/other	9.745	15.592	20.270	24.325	29.190
Increase	60%	60%	30%	20%	20%
Energy storage and systems	5.081	6.606	8.58	11.164	14.513
increase	30%	30%	30%	30%	30%
Auto leasing and reg	5.527	7.185	9.341	12.144	15.787
increase	30%	30%	30%	30%	30%
Total revenue	109.882	144.830	184.980	220.026	261.714

5.1.2.2 Costs and operating expenses

As previously done before in GM company, the total costs and operating expenses will be measured as margin of the total revenue, as shown in **Table X,** which demonstrates that the company is decreasing both margins during the last years in order to become more profitable and because of the economies of scale gains, reducing the unitary cost as more cars are produced.

Table 5.15- Tesla´s past costs and operating expenses

Year	2018	2019	2020	2021	2022
Total costs of revenues	17.419	20.509	24.906	40.217	60.609
Margin	81%	83%	79%	75%	74%

Total operating expenses	4.430	4.138	4.636	7.083	7.197
Margin	21%	17%	15%	13%	9%

To obtain the future costs and operating expenses, the values will be estimated based on the margins assumed. Regarding the costs, it is not possible to keep the same rate of cost reduction, as the costs can reduce but would become relatively very low, so keeping a conservative approach, the margin rate will consider decreasing 1% every year. In the other side, the future operating expenses margins will keep the same at 9%, as the expenses are already at a low rate and the increase of property and investments in other fabrics may not lead to a reduction of these expenditures. The final projections of both factors can be seen in the **Table X**.

Table 5.16- Tesla´s future costs and operating expenses (U$ million)

Year	**2023**	**2024**	**2025**	**2026**	**2027**
Total costs of revenues	80.214	104.278	131.336	154.019	180.583
Margin	73%	72%	71%	70%	69%
Total operating expenses	9.889	13.035	16.648	19.802	23.554
Margin	9%	9%	9%	9%	9%

5.1.2.3 Capex and Depreciation projection

According to the last annual financial report, the future trends for capital expenditures are expected to be between U$6 to U$8 billion and between U$7 to U$9 billion in the next years. The value is considered high due to the future investments that Tesla is doing to increase the production and creation of other factories, such as the new construction of a factory in Mexico (source). So, an estimative based on this information for the future capex will be an estimated average of U$ 7 billion for 2023 and U$8 billion for the next years.

Regarding the D&A, the value of the D&A will be generated as a proportion of the Property, Plant and Equipment, operating lease vehicles and solar energy systems,

which are the main assets that are suffer depreciation. The historical D&A and the percentage from these assets are shown in the **Table** x.

Table 5.17- Tesla´s past D&A and assets

Year	2018	2019	2020	2021	2022
PPE+ Operating lease vehicles + Solar Energy systems	19.690	18.981	21.813	29.160	34.072
D&A	1.901	2.154	2.322	2.911	3.747
D&A percentage	9,7%	11,3%	10,6%	10,0%	11,0%

The D&A percentage during the last years does not show a great variation, so the future percentage value will be considered as an average value from the last years which is 10,53%. The next is projecting the future value of these assets, the PPE is easier to calculate since the capex value is provided and the D&A is at greater value linked to the depreciation of PPE, that has a greater value and a reduced useful life when compared to the Solar energy, for example. For the operating leases and the solar energy, a better analysis considers the past growth, as show in **Table X.**

Table 5.18- Tesla´s past Operating lease vehicles and Solar Energy systems

Year	2018	2019	2020	2021	2022
Operating lease vehicles	19.690	18.981	21.813	29.160	34.072
Increase	-	17%	26%	46%	12%
Solar Energy systems	1.901	2.154	2.322	2.911	3.747
Increase	-	-2%	-3%	-4%	-5%

For the solar energy systems theres a slower trend that its value is reducing which makes sense to the Tesla´s politics of focusing on EVs production and neew developments in this area. As the value is slowing decreasing, the future projection will consider an average decrease in the past years of 3,3%. Regarding the Operating

lease vehicles, there is not much information to provide a better estimative so the projection will take the average of the last years, without considering the year of 2021 that is higher than the other growths, resulting in a future increase of 18% yearly. Estimating the final projection of all these assets and the future D&A as a percentage of those, the final D&A values are displayed in the **Table X,** reminding that D&A will be 10,53% of these assets.

Table 5.19- Tesla´s D&A projection (U$ million)

Year	2023	2024	2025	2026	2027
PPE	26,565	30,113	33,215	35,891	38,155
Operating lease vehicles	5,959	7,053	8,348	9,880	11,694
Solar energy systems	5,309	5,135	4,968	4,805	$4,648
Total value	37,835	42,302	46,532	50,578	54,498
D&A	3,982	4,453	4,898	5,324	5,736

5.1.2.4 NWC projection

Calculating the NWC as the sum of inventories, account receivables and subtracting the account payables, the projection of the NWC will be attached to the sales such as in GM´s case to avoid extreme volatility, however the historical values show that the margin doesn't follow any trend and varies a lot during the years, as it can be seen in the **Table X**.

Table 5.20- Tesla´s past NWC (U$ million)

Year	2018	2019	2020	2021	2022
NWC	658	1.105	-64	-2.355	536
Margin	3,07%	4,50%	-0,20%	-4,38%	0,66%

As the margin varies a lot during the years, the preposition will be that the value will keep at a rate of 1% and then steadily increase to 3% because Tesla still have a lot of difficulties to deliver the cars to the customers which lead to a low inventory during the future years and a lower increase of this efficiency as there is still a lot of demand for the cars not being met. The final projection of NWC is shown in **Table X.**

Table 5.21- Tesla´s future NWC (U$ million)

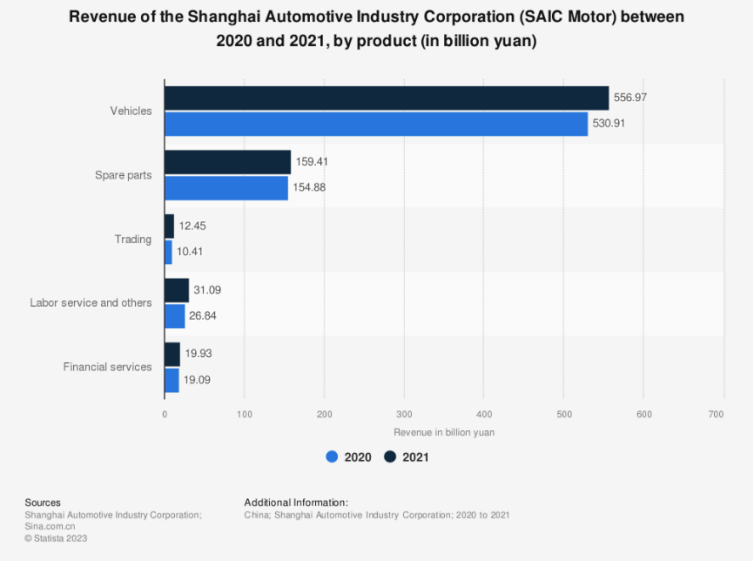
Year	2018	2019	2020	2021	2022
NWC	1.099	2.897	3.700	6.601	7.851
Margin	1%	2%	2%	3%	3%

5.1.3 SAIC

5.1.3.1 Revenue growth

The revenue of SAIC is concentrated mainly in vehicles sales as shown in **Figure X**, the sale concentration is on vehicles segment with approximately 70% of total revenue. Also, from all the 5,3 million vehicles sold in 2022, keeping as the leader China in car sales, from all of these vehicles 2,78 million of self-owned cars, a 52,5% year increase and sales of 1,07 million new electric vehicles, totalizing a 46,5% year increase (source)

Figure 5.1- SAIC Motor revenue per segment



Source: (Sina.com.cn., 2022)

Another interesting aspect to consider is that the chinese market is expected to increase the vehicles sales approximately up to 13% until 2027 (Statista source). And regarding electric vehicles, the growth perspective is of 115% until 2027 (source). In order to project the future revenue, the projection will be of fossil vehicles and eletric vehicles, using the market expected growth, since the company is the market leader in china and will probably grow in the same market perspective. The revenue perspective is shown in the **Table X,** using the proportion of fossil vehicles to electric vehicles.

Table 5.22- Future revenue perspective for SAIC (USD billion).

Revenue	2022	2023	2024	2025	2026	2027
New Electric Vehicles	22,22	25,90	30,18	35,18	41,00	47,78
Fossil vehicles	87,86	90,03	92,26	94,54	96,88	99,28
Total	110,08	115,93	122,44	129,72	137,88	147,06

As the company is currently highly investing in electric vehicles, with a historical growth during the past years, the growth is consistent with the historical revenue values. The increase in electric vehicles and rapidly growth can make the company surpass the pre pandemic size, that was reported in 2019 to be approximately USD 133,31 billion. Also, the estimation seems conservative enough considering that in the chinese market there are a lot of players growing and gaining more market share.

5.1.3.2 EBIT growth estimation

The estimation of COGS and the expenses will be made by first analyzing the past EBIT margins of revenue, as previously made in the past companies in this report to understand if there is any estimation or inference about these values. So, according to the Table X, it is possible to analyze the following results:

Table 5.23- Historical EBIT values (million chinese yuan)

Year	2018	2019	2020	2021	2022
EBIT	53.673	40.345	35.607	41.446	26.022
Margin	6.0%	4.9%	4.8%	5.5%	3.6%

The margins don't show a clear trend of the past margin values, the margins vary a lot during the years. So, in order to avoid further imprecisions trying to predict any future trend of these values and for lack of information of the future profitability of the company, also as the company is investing in new electric vehicles production plants it is considerable to believe that these margins will not go up to higher values. Thus, the EBIT margin that is going to be used in the projection will be the average past margins which results in 5% and the final values ate shown in Table X.

Table 5.24- Future SAIC EBIT projection

Year	2023	2024	2025	2026	2027
EBIT	5.745	6.068	6.429	6.833	7.288

5.1.3.3 D&A projection

After projecting the EBIT values for the next 5 years, the next projection will be the D&A that will be estimated differently from the other companies by the revenue margin which is an approach also possible to be made according to Damodaraan. In the Table X, it is possible to see that the D&A margin is growing at a steady rate.

Table 5.25- Past D&A margins (million chinese yuan)

Year	2018	2019	2020	2021	2022
D&A	11.483	13.474	14.461	17.684	18.037
Margin	1,3%	1,6%	2,0%	2,3%	2,5%

The future D&A margin value will be considered as the last value of 2,5% in 2022, because of the future investment of the company in new EVs plants which will generate more future depreciations of these assets. It is not considerable to admit that

the margin rate wil be increasing each year steadily since the revenue size of the company will increase a lot with the future investments. The final D&A values obtained are shown in the **Table X**.

Table 5.26- Future SAIC D&A

Year	2023	2024	2025	2026	2027
D&A	2.898	3.061	3.242	3.446	3.676

5.1.3.4 Capex projection

Regarding the SAIC´s future Capital expenditures, the company announced an U$43 billion investment in the development of autonomous and electric vehicles, as these investments tend to be related to an increase in the properties, equipment and other fixed assets, this value will be distributed through the next 5 years. As this value may not be all invested at once during this period, the capex considered to be used on each year will be U$ 6 billion, which gives a total value of U$ 30 billion. This value for the capex is also good approach especially when compared to Tesla´s capex value, a very similar value since SAIC needs to invest in new technologies at a same pace as one of the biggest competitors in the market.

5.1.3.5 NWC projection

The last projection to calculate the future cash flows is the NWC projection, that as preciously made in some other cases it was estimated as a margin value from the revenue. The last years NWC and the margins are shown in the **Table X**.

Table 5.27- SAIC NWC margins (million Chinese yuan)

Year	2018	2019	2020	2021	2022
NWC	-26,193	-41,347	-35,951	-53,127	-15,196
Margin	-2.9%	-5.0%	-4.9%	-7.0%	-2.1%

The negative NWC values are attributed to the fact that the company has high account payables that are still at a higher value than inventories and accounts receivables. The values don’t show any trend that are following, considering that a deeper analysis of

each factor that composes the NWC will be taken in account, as it can be seen in **Table X,** there are shown the historical variations of inventories and account payables and receivables.

Table 5.28- SAIC inventories, account payables and receivables (Million Chinese Yuan)

Year	2018	2019	2020	2021	2022
Inventories	58.943	54.399	69.395	56.636	88.535
Increase	-	-8%	28%	-18%	56%
Acc. receivables	40.129	41.340	43.602	47.463	62.913
Increase	-	3%	5%	9%	33%
Acc. payables	125.265	137.086	148.948	157.226	166.644
Increase	-	9%	9%	6%	6%

Account payables are increasing at a constant rate, to estimate their future values is fair to estimate that the growth will be the average increase of 7,5%. Regarding the inventories receivables, there was an increase in their value of 33% which escaped from the average growth, in that sense it would be more sensible to discard the last value increase and assume that the payables will grow at a rate of 10%, keeping a similar pace as 2021. Lastly, the inventory growth doesn't seem to present a continuous trend on their values, the average value is approximately 14%, so the main future assumption used here is that inventories will grow at a lower rate of 5%, since the company will produce more EVs but probably will not surpass the chinese demand generating a huge inventory size. Finally, the final value is shown of NWC is shown **in Table X**.

Table 5.29- SAIC future NWC value (U$ million)

Year	2023	2024	2025	2026	2027
Inventories	13.851	14.544	15.271	16.035	16.836
Acc. receivables	10.311	11.343	12.477	13.725	15.097

Acc. payables	26.692	28.694	30.846	33.160	35.647
=NWC	-2.529	-2.808	-3.098	-3.401	-3.713

5.2 WACC calculation

The next step after projecting making the estimations for future key financial data that will be used in the calculation of future cash flows will be the calculation of the discount rate, the WACC rate. The rate as mentioned before is calculated by doing the weighted average between the cost of equity and the cost of debt. The next steps show the detailed approach used in the estimation of the values.

5.2.1 GM

5.2.1.1 Cost of equity

The first step to estimate the cost of equity is to determine the risk-free rate, the market premium rate and the value of β, the indicator of volatility of the company compared to the market. As GM is an international enterprise focused especially on the US market, the value of the risk free is estimated as the US 10 year treasury rate, the which is considered as the risk zero rate which is valued in 3,8% (source).

The market risk is estimated as the yearly return of one of the biggest stock indicators in the US, the S&P 500, to obtain the level, it was made a regression model to estimate the average rate on the last 5 years, the returns of the index on each year are shown in the **Table X.** Applying the regression method, the final yearly rate was approximately 9,33%.

Table 5.30- S&P 500 index yearly return (source)

Year	**2018**	**2019**	**2020**	**2021**	**2022**
Growth	-4,23%	31,21%	18,02%	28,47%	-18,01%
Average return	-	-	-	-	9,33%

The value for β can be calculated in multiple forms such as by using β levered and unlevered of comparable companies in the same field. However, as this approach may take much effort to calculate, it can be used a value already obtained from a trustable finance website, which gives a value of 1,35. After collecting all the necessary information the cost of equity is given by:

$$K_E = r_f + \beta(r_m - r_f) \Rightarrow K_E = 3{,}8\% + 1{,}35(9{,}33\% - 3{,}8\%) \Rightarrow K_E = 11{,}27\%$$

5.2.1.2 Cost of debt

The cost of debt in the other hand is calculated by the interest expense of the whole debt. The value of the debt should be calculated as the market value however as the lack of information of the market debt value the amount calculated will be estimated as the accounting debt. The calculation of cost of debt results in:

$$K_D = \frac{Interest\ expense}{Debt} \Rightarrow K_D = \frac{7022}{110566} = 6{,}35\%$$

5.2.1.3 Final WACC

After calculating the cost of det and equity, the final WACC value will be given by the following equation:

$$WACC = K_E * \frac{E}{D+E} + K_D * (1 - t_C) * \frac{D}{D+E} \Rightarrow$$

$$WACC = 11{,}27\% * \frac{46.277}{156.843} + (1 - 0{,}21) * 6{,}35\% * \frac{110.566}{156.843} \Rightarrow WACC = 6{,}86\%$$

Comments about WACC compared to other companies.

5.2.2 Tesla

5.2.2.1 Cost of equity

Tesla´s cost of equity is going to be calculated in a similar way as GM, because of the market geographic similarity, focusing on the worldwide markets but especially in focusing in the US. To obtain the final cost of equity it can be used the risk free index as the US 10 year treasury rate which is valued as 3,8%. For the market risk, the value was already calculated as the average past 5 years yearly returns of the S&p 500, which is 9,33% according to the **Table** X. The beta value of Tesla is estimated through its average market volatility in the last 5 years, which has a value of 2 (**source**). Calculating the final cost of equity it is obtained:

$$K_E = r_f + \beta(r_m - r_f) \Rightarrow K_E = 3{,}8\% + 2(9{,}33\% - 3{,}8\%) \Rightarrow K_E = 14{,}84\%$$

5.2.2.2 Cost of debt

The cost of debt is obtained in a similar way as in the GM, where the value of the debt should be calculated as the market value however due to a lack of information the value will be estimated as the accounting debt. The calculation of cost of debt results in:

$$K_D = \frac{Interest\ expense}{Debt} \Rightarrow K_D = \frac{191}{2045} = 9{,}34\%$$

5.2.2.3 Final WACC

The proportion of equity to debt is very high, so the final WACC should be very similar to the cost of debt. As the market capitalization of tesla is currently U$817,858 millions, the calculation of WACC value leads to:

$$WACC = K_E * \frac{E}{D+E} + K_D * (1 - t_C) * \frac{D}{D+E} \Rightarrow$$

$$WACC = 14{,}84\% * \frac{817{,}858}{819{,}903} + (1 - 0{,}21) * 9{,}34\% * \frac{2{,}045}{819{,}903} \Rightarrow WACC = 14{,}84\%$$

The WACC is considered high, especially when compared to GM, however this higher value reflects the capital structure and the higher risk that an investor is taking when investing in Tesla, since it is still a very volatile company with many high future expectations of growth.

5.2.3 SAIC

5.2.3.1 Cost of equity

The cost of equity computation for SAIC is different from the other firms mentioned before, especially because the company is based in China. The formula used to obtain final result is the same however the company is exposed to different tax percentage and risk premium. According to Damodaran, the tax percentage in China is considered as 25% and the risk premium is 7,16%, the risk-free rate used is the china government 10Y bond which is valuated at 2,73%. The beta value was obtained from website as 1,01, the final cost of equity then will be:

$$K_E = r_f + \beta(r_m - r_f) \Rightarrow K_E = 2{,}73\% + 1{,}01(7{,}16\%) \Rightarrow K_E = 9{,}96\%$$

5.2.3.2 Cost of debt

The cost of debt was calculated the same way as done previously in the other cases which resulted in the final value:

$$K_D = \frac{Interest\ expense}{Debt} \Rightarrow K_D = \frac{0{,}55}{7{,}40} = 7{,}51\%$$

5.2.3.3 Final WACC

After computing both costs necessaries for the WACC value, it was used the market value of the equity as the current market capitalization of the company which is U$23,01 billion. The debt value as lack of information of the market valuation it was used the accounting value that was already mentioned as U$ 7,4 billion. Computing the final WACC it is obtained the final result:

$$WACC = K_E * \frac{E}{D+E} + K_D * (1 - t_C) * \frac{D}{D+E} \Rightarrow$$

$$WACC = 9{,}96\% * \frac{23{,}01}{30{,}41} + (1 - 0{,}25) * 7{,}51\% * \frac{7{,}40}{30{,}41} \Rightarrow WACC = 8{,}91\%$$

5.3 Final Enterprise Value computation

After calculating all the future projections of main financial data and discount rates for the companies, the final step consists of calculating the free cash flows and bringing them to a present value using the WACC discount rate. After that there will be the estimation of the terminal value after the projections for the next 5 years, which will be calculated projecting the future growth perspective of the company or using a multiple method.

5.3.1 GM

The final cash flows to firm related GM are shown in the **Table X,**

Table 5.31- GM´s FCFFs projections for the next 5 years

Year	2023	2024	2025	2026	2027
EBIT	8.809,18	9.393,23	10.016,00	10.680,06	11.388,15

Taxes	1.849,93	1.972,58	2.103,36	2.242,81	2.391,51
D&A	12.128,28	12.285,08	12.494,47	12.756,94	13.073,20
ΔNWC	3.394,53	738,68	354,45	377,95	403,01
CAPEX	12.805,46	13.301,60	13.851,96	14.458,51	15.123,44
= FCFF	2.887,55	5.665,45	6.200,70	6.357,73	6.543,38

Before discounting the cash flows to the present value using the WACC rate, it will be estimated the Terminal Value of the company, the future cash flows of the company assuming an infinity horizon. The Terminal Value will be estimated in this case by adopting the future growth perspective of the USA market, a great parameter for that approximation is the increase in the US GDP, considering the inflation in the last years. The average annual growth of the American real GDP during the last 10 years was approximately 2,09% (source) and the inflation rate around 1,88% (source). So, estimating an average perpetual growth rate such as the american GDP growth, its possible to estimate a rate of increase of 3,97%. Therefore, the terminal value for GM will be:

$$TV = \frac{FCFF_{2027}(1+g)}{WACC - g} \Rightarrow TV = \frac{6.543{,}38(1+3{,}97\%)}{6{,}86\% - 3{,}97\%} = \$235.307{,}35$$

After calculating all the FCFFs and the TV for the company, all the values are discounted by the WACC as shown in the **Table X**.

Table 5.32- GM´s discounted FCFFs

Year	**2023**	**2024**	**2025**	**2026**	**2027**
FCFF	2.887,55	5.665,45	6.200,70	6.357,73	6.543,38
TV	-	-	-	-	235.307,35
Discounted values	2.702,15	4.961,29	5.081,37	4.875,53	168.863,46
EV value	-	-	-	-	186.483,79

Summing all the discounted values, the DCF method provides a final enterprise value for the company of U$186.483,79 billion.

5.3.2 Tesla

Adding all the future projections done in the previous section, the future cash flows are shown in the **Table X.**

Table 5.33- Tesla´s FCFFs projections for the next 5 years (U$ million)

Year	**2023**	**2024**	**2025**	**2026**	**2027**
EBIT	19.779	27.518	36.996	46.206	57.577
Taxes	4.154	5.779	7.769	9.703	12.091
D&A	3.982	4.453	4.898	5.324	5.736
ΔNWC	563	1.798	803	2.901	1.251
CAPEX	7.000	8.000	8.000	8.000	8.000
= FCFF	12.045	16.394	25.322	30.925	41.972

After calculating the FCFFs, it needs to be calculated the Terminal value, between the two approaches of multiple value and future perpetuity growth, the estimation will be done by using the future perpetuity because relative multiples such as EBITDA multiples may indicate overvalued results. Thus, the future perpetuity cannot be approached as considering the same FCFF growth, as in the future the company will grow in a lower rate. Considering that, the growth perspective should be higher than the future US GDP real growth of 3,97% as mentioned before, so since the company is leading a market field with still a lot of growth an estimation for that value should be between the last revenue growth of 20% and the US GDP growth. The estimation used for the perpetual growth will be 9% (source), assuming a very conservative scenario because bigger tech innovative companies such as Apple and Facebook managed to keep the growth at a rate of 15%. Finally, the terminal value will be:

$$TV = \frac{FCFF_{2027}(1+g)}{WACC - g} \Rightarrow TV = \frac{41.972(1+9\%)}{14{,}84\% - 9\%} = \$782.952$$

Discounting the future cash flows at the WACC rate, results are show in the **Table X**

Table 5.34- Tesla´s discounted FCFFs

Year	2023	2024	2025	2026	2027
FCFF	12.045	16.394	25.322	30.925	41.972
TV	-	-	-	-	782.952
Discounted values	10.48	12.430	16.718	17.778	391.931
EV value	-	-	-	-	449.345

Summing all the discounted values, the DCF method provides a final enterprise value for the company of U$449.345billion.

5.3.3 SAIC

The final computation of all the future projections provides a free cash flow to firm on each year described in the **Table X**.

Table 5.35- SAIC´s FCFFs projections for the next 5 years (U$ million)

Year	2023	2024	2025	2026	2027
EBIT	5.745	6.068	6.429	6.833	7.288
Taxes	1.436	1.517	1.607	1.708	1.822
D&A	2.898	3.061	3.243	3.447	3.676
ΔNWC	-265	-278	-291	-302	-313
CAPEX	7.000	7.000	7.000	7.000	7.000
= FCFF	472	890	1.355	1.874	2.455

The final estimation of the terminal value will consider as in the other cases the perpetuity of the company. The firm may as bigger player in the market will present a

slower growth in the future that will not keep the same rate as in the next years, a conservative analysis considers the country´s GDP growth. China´s last GDP growth during the last 4 years was reported as approximately as 4,9%, using this value as the future growth, the final terminal value is:

$$TV = \frac{FCFF_{2027}(1+g)}{WACC - g} \Rightarrow TV = \frac{2.455(1+4{,}9\%)}{8{,}91\% - 4{,}9\%} = U\$64.226$$

Discounting all these values to a present value, the values obtained are shown in the **Table X.**

Table 5.36- SAIC´s discounted FCFFs (U$ million)

Year	2023	2024	2025	2026	2027
FCFF	472	890	1.355	1.874	2.455
TV	-	-	-	-	64.226
Discounted values	434	751	1,049	1,332	41,915
EV value	-	-	-	-	45.480

Summing all the discounted cash flows the final EV obtained is U$45.480 billion.

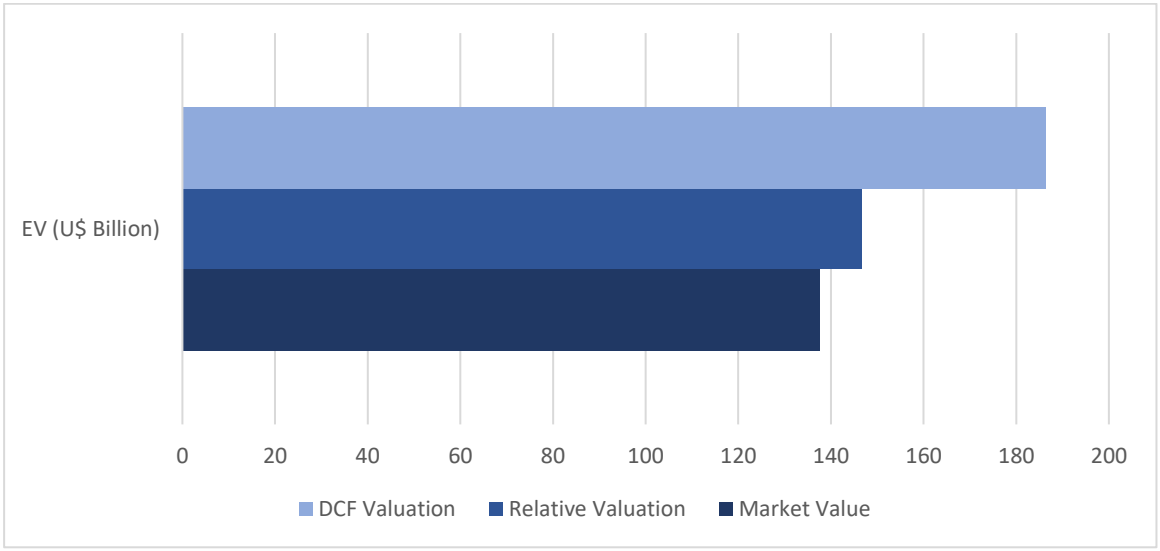
6. Market comparison and final analysis

After applying both valuation methods, the final result will be compared based on the final range of values obtained and comparing it to the market values, indicating which companies are generating more value with the adoption of new technologies in the automotive industry.

6.1 GM

The final GM EV calculated using the relative valuation was US$146,7 billion, while using the discounted cash flow method the value was U$186,48 billion. The range of values are at a similar range, it would be very difficult to obtain values that are very similar since the assumptions for the relative valuation consider only similar company's structures however it is not totally considering how the company pretends to grow with new technologies and trends. When comparing to the market capitalization and final enterprise value the actual Enterprise Value is U$137,66 billion. A better view comparing the results is shown at Figure 6.1.

Figure 6.1- Comparison of GM EV

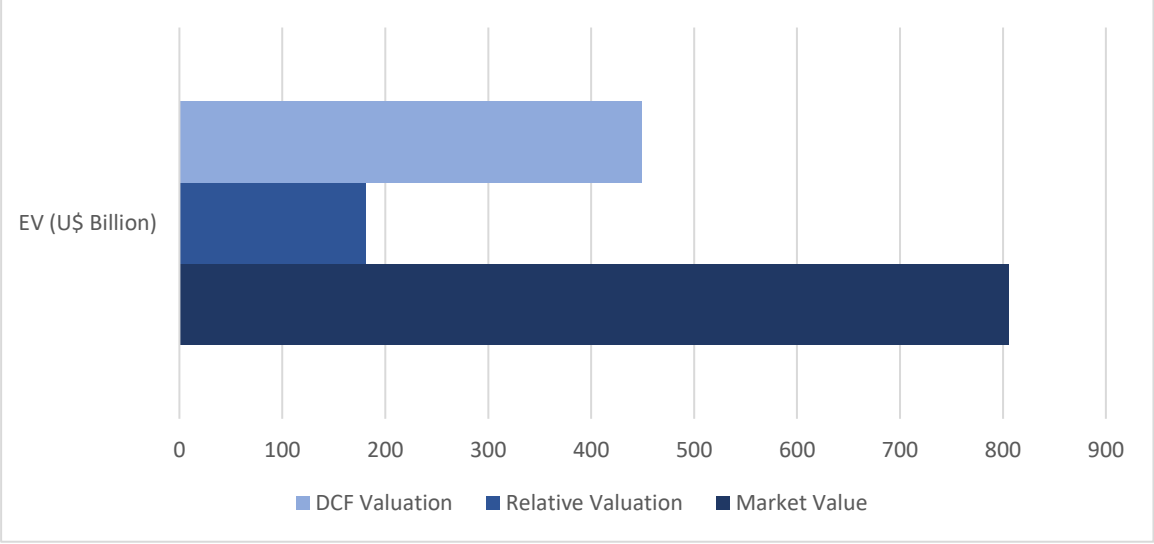


The relative valuation presents a slightly difference from the actual market valuation, which is almost 7%, such a small variation cannot infer nothing about an overvaluation since there are smaller variations due to the specific comparable companies used in the valuation that can provide an eventual lower value. The DCF on the other hand, shows an overvaluation of approximately 35%, due to the expectation of trends that GM is trying to follow to keep a higher profitability and increase the revenue. However, the overvaluation is not as high as the other companies and could be reduced considering lower sales growth and profitability especially.

6.2 Tesla

The final Tesla valuation methods provide a wide different value, using the relative valuation it was obtained a value of U$181,73 billion and a U$449.345billion using the DCF method. The market value of the firm´s EV is of approximately U$805,53 billion, a better view of the comparison between the values is shown at the Figure 6.2.

Figure 6.2- Tesla Enterprise Value comparision



Both methods show a great overvaluation of the company, the relative valuation provided the lowest EV value, which represents approximately 22,5% of the total company market EV. The relative valuation may provide the worst result since it is very difficult to find companies that are exact comparable firms such as Tesla, not all the companies have the same cash flows, size and future growth perspective. Tesla is an unique company in the automotive sector that has been innovating for a longer time and focuses all the cars produced in electric vehicles and with the automatization of

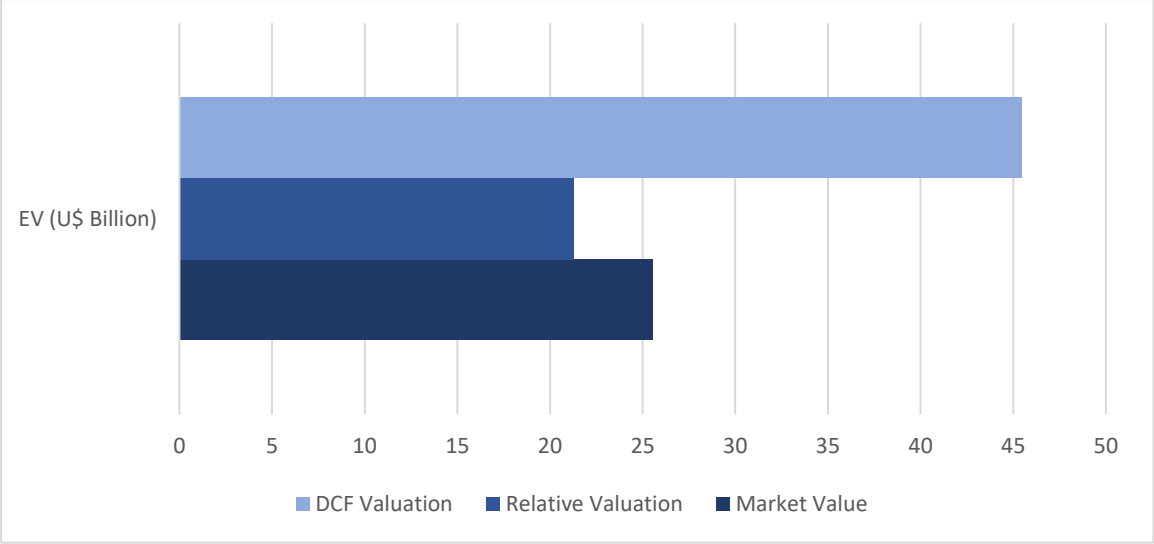
them. The best understanding of the company´s valuation can be made by analyzing the DCF method, which provides a value 55% lower than the market value. The overvaluation is explained by the fact that many investors believe that Tesla will generate higher revenue growth and increasing profitability, as Tesla is delivering new vehicles models, new investments in production plants and the delivering greater results such as the latest 44% revenue growth in 2022. All these factors contribute to generate higher expectations among investors, generating an higher value especially when compared to the valuation was made in this thesis, considering more conservative scenarios of future revenue and profitability especially.

However even if there is a different perception of future cash flow generations, the difference is still very high and would need to use very aggressive assumptions to obtain a similar result. So, it is possible to infer that there is a great market overvaluation in the firm.

6.3 SAIC

Regarding SAIC, the relative valuation provided an EV of U$21,3 billion and the DCF a final result of U$45,48 billion. The EV market value is valuated as U$25,54 billion, a better vision about the values comparison can be seen in Figure 6.3.

Figure 6.3- SAIC EV comparison



The comparison shows that clearly the relative valuation has a similar value to the market value, this can be inferred as the company as an incumbent company, still not

provides many innovations and increasing new revenue drivers, which makes a relative valuation a great way to estimate the EV since there are more companies with similar structures. However, the relative valuation cannot infer properly if the company is overvalued since the EV are very similar and some market particularities can reflect this difference. The DCF method on the other side shows a bigger undervaluation of the company, as the EV is almost 80% higher than the market. The main reason for it might be related to the assumptions that were used in the DCF especially regarding the revenue increase as the company is moving towards a more electrified vehicles field and about the profitability and future investments. The lower market value also can be related to the firm being state owned, in other words, many investors may fear that and will not put higher amounts of investments.

Pointing out these factors on each valuation, it is possible to say that there is a high undervaluation especially when considering the future electric vehicles trends that the firm is trying to follow to achieve a higher market share.

7. Conclusion

After a detailed comparison and valuation of some of the most important players in the automotive sector, this thesis identified how the main automotive companies in the world can generate future value. The analysis of different companies that are exposed to different environments, risk and financial structures could provide interesting insights about how these companies can generate value for all of the investors.

GM valuation provided a valuation of one of the biggest American historical players in the market, analyzing how the company is valued against some of the main comparable companies and how the company is adapting in order to retain a greater market value and increase its current market value. The relative valuation showed a similar value to the company´s market value as the investors may feel that as an well-established firm in the market can be valued similar to the main competitors. However the future revenue growth of the company with increasing investments in many areas can generate a greater valuation, as it was spotted in the DCF method. By the trends analyzed it can be inferred that there is some undervaluation of the company considering these factors.

The Tesla valuation on the other hand provided the lowest valuation results when compared to the market valuation, the relative valuation demonstrated the lowest value, as it may not be the most efficient way to compare Tesla with other companies since the firm is unique. The firm is relying on increasing future expectations of revenue and profitability since the firm is a pioneer in the electric and autonomous vehicles field. The DCF method however showed an overvaluation, even when considering the future trends of revenue for each auto model.

Lastly, considering the Chinese environment which is one of the biggest automotive markets in the world, SAIC´s valuation showed a similar market value when using the relative valuation, like GM case as both companies are already well established. The DCF method, considering the adoption and investment in the electrification showed in fact that the firm has still great potential to generate a higher value for all investors. From all the companies, Tesla showed the highest valuation and so an overvaluation comparing to its market value which is intrinsic to the nature of future revenue projection of the electric vehicles market that was presented in the beginning of this thesis.

Concluding, the valuation methodology could provide an interesting insight into how the companies are adopting future market trends to increase their total enterprise value. It was interesting to analyze how each company is valued in the market and how the adoption of innovative technologies can provide such a higher growth expectation.

Bibliography

Automotive industry Worldwide. (2023, 04 26). Retrieved from Statista: https://www.statista.com/topics/1487/automotive-industry

Automotive Industry Worlwide. (2023, 04 25). Retrieved from Statista: https://www.statista.com/topics/1487/automotive-industry/#topicOverview

Company, G. M. (2022). *Annual Financial Report 2022.*

Damodaran, A. (2012). *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset.* New York: Wiley Finance.

EU effective ban new fossil cars. (2023, 04 05). Retrieved from reuters: https://www.reuters.com/markets/europe/eu-approves-effective-ban-new-fossil-fuel-cars-2035-2022-10-27/

Global Car & Automobile Manufacturing Industry - Market Research Report. (26 de 04 de 2023). Fonte: IbisWorld: https://www.ibisworld.com/global/market-research-reports/global-car-automobile-manufacturing-industry/

Little, A. D. (2022, 05 02). *Average EV financial subsidies*. Retrieved from Statista: https://www.statista.com/statistics/1332156/average-ev-financial-subsidies-at-purchase/

Sina.com.cn. (2022, 06 01). *Revenue of the Shanghai Automotive Industry Corporation (SAIC Motor) between 2020 and 2021*. Retrieved from Statista: https://www.statista.com/statistics/1023799/china-revenue-of-shanghai-automotive-industry-corporation-saic-by-segment/

Statista. (01 de 06 de 2023). *Electric Vehicles - Worldwide.* Fonte: Statista: https://www.statista.com/outlook/mmo/electric-vehicles/worldwide

V.J. Thomas, Elicia Maine . (2019). Market entry strategies for electric vehicle start-ups in the automotive industry – Lessons from Tesla Motors. Em E. M. V.J. Thomas, *Market entry strategies for electric vehicle start-ups in the automotive industry – Lessons from Tesla Motors* (pp. 653-663). Journal of Cleaner Production. Fonte: https://www.sciencedirect.com/science/article/pii/S0959652619322498

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2. List of Symbols

Symbol	Description
CAGR	Compound Annual Growth Rate
DCF	Discounted Cash Flow
WACC	Weighted Average Cost of Capital
EV	Enterprise Value
EVs	Electric Vehicles
GM	General Motors
USD	American dollars
D&A	Depreciation and Amortization
NWC	Net Working Capital
FCFF	Free Cash Flow to Firm