The Market Analysis for BYD

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Abstract. The article first introduces the current situation of BYD, including current market value, various fields involved in BYD (automobile, batteries, electronics) and some awards BYD have had. Second, the article uses a lot of important financial data, such as D/E ratio, asset beta, return on asset, to analyze BYD's current financial situation, and also makes a comparative analysis with Tesla and Mercedes-Benz. Then, the article also uses the SWOT analysis method to study BYD from four major perspectives (Strength, Weakness, Opportunity, Threat). With the help of SWOT, there will be a deeper understanding of BYD's auto industry. Finally, the article also examines the risks, challenges and sources of them that BYD faces. Such as the dependence on chip technology and the impact of Covid-19. There are still lots of potential danger that BYD needs to consider and solve. In this way, the understanding of BYD's business market model can be revealed better.

Keywords: BYD · SWOT · risk analysis · New energy vehicles · Government Subsidy

1 Introduction

BYD Co., Ltd. (BYD for short) is a Chinese private enterprise established in February 1995. It is headquartered in Shenzhen, Guangdong. The company has more than 220,000 employees. The company's business includes four major industries: automobile, rail transit, new energy and electronics. It is currently one of the largest new energy vehicle manufacturers and mobile phone manufacturers in China. In 2015, BYD won the first award for the new energy industry since the founding of the United Nations 70 years ago - the "United Nations Special Energy Award". In 2016, BYD won the "Zayed Future Energy Award" Large Enterprise Award [1]. This is also in line with BYD's brand mission of "using technological innovation to satisfy people's yearning for a better life" and the development concept "technology is king, innovation is the foundation".

As one of the best new energy vehicle manufacturers in China, BYD's sales volume is constantly growing. In December 2021, BYD's new energy passenger vehicles sold 93,338 units. In the month, BYD's passenger car sales totaled 97,990 units, a year-on-year increase of 77.9%. Among them, new energy passenger vehicles soared by 236.4%

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V. Gaikar et al. (Eds.): FMET 2022, AEBMR 227, pp. 246–256, 2023.
https://doi.org/10.2991/978-94-6463-054-1_28

year-on-year, breaking the 90,000 mark for two consecutive months. Such growth is inseparable from BYD's strong scientific research foundation. BYD Group has established 11 research institutes with more than 35,000 technicians. As of April 2021, the Group has applied for about 32,000 patents globally, of which about 21,000 have been authorized. BYD's patent innovation index, quantity and intensity ranked first in China's new energy vehicle patents.

In the field of automobiles, BYD's new energy vehicles have formed two major product lines, passenger cars and commercial vehicles. In the passenger car market, BYD mainly focuses on fuel vehicles and new energy vehicles. Since 2008, BYD has continued to launch a number of new energy models, and the sales volume has been extremely impressive. It has won the annual sales champion of new energy passenger vehicles in the world for three years. With the participation of top global talents such as former Audi design director Wolfgang Egger and former Mercedes-Benz chassis tuning expert Heinz Keck, BYD has entered a "new era of car building". In the field of commercial vehicles, BYD has a product line of pure electric buses, pure electric trucks and pure electric forklifts. Its various pure electric commercial vehicles have been highly appreciated by top domestic and foreign customers including Shenzhen Bus Group, Transport for London, Los Angeles Public Transport Company, Sydney Airport, Stanford University, and Facebook.

In the field of batteries, BYD also maintains 100% independent research and development, design and production. At present, BYD's products have covered consumer 3C batteries, power batteries, solar batteries, and energy storage batteries, and have formed a complete battery industry chain. Not only that, BYD's batteries are also widely used in rail transit, solar power plants, and energy storage power plants. Because of this, BYD is the world's leading supplier of solar energy and energy storage solutions, and its products are exported to the United States, Germany, Japan, Switzerland, Canada, Australia, South Africa and other countries and regions.

In the field of electronics, BYD has become the world's leading electronic product design and manufacturing service provider. It provides a series of services and has achieved industry leadership in the mobile terminal structural parts.

2 Data Comparison and Government Subsidies

2.1 Data Comparison

This table is about the data comparison between BYDDY, Tesla and Mercedes Benz. According to the data from Yahoo Finance, some data between different companies have a relatively big difference (Table 1).

2.1.1 Leverage Ratio

First, an important data that can be compared in the table is the leverage ratio. BYDDY's leverage ratio is about 0.974, and Tesla's leverage ratio is 1.55, and Mercedes-Benz is the one with the highest leverage ratio which is 2.55. From this numbers different type of strategy that these three companies are using can be found out and seen why they are doing this.

Table 1. Data comparison between BYDDY, Tesla and Mercedes Benz (Unit: Million Dollars)

Item	Company		
	BYDDY	Tesla	Mercedes-Benz
Market value of equity	191.54	789.98	279.39
Market value of debt	104.24	166.73	20.07
Leverage	0.974	1.55	2.55
D/E	0.29	0.21	1.36
Marginal tax rate	12.19	11.02	30.11
Equity Beta	0.65	2.12	1.35
WACC	7.3	7.8	7.66
rE	8.70	7.85	8.98
rD	4.6	4.25	4.84
rA	5.62	9.9	8.6
βA	0.44	1.24	1.78

Nearly half of the BYDDY's equity is debt and this means that BYDDY can get a higher tax shield and a lot more cash flows. However, companies such as Tesla and Mercedes Benz are more likely to keep the market value of debt smaller. In this way, BYDDY has a great benefit comparing to Mercedes Benz and Tesla because according to the trade-off theory, higher market value of debt can help with the deduction of corporate income tax. Due to the different order of paying the interest on debt and dividends, tax laws used by different countries in the world basically allow interest expense to be paid before tax, and dividends should be paid after the tax. With the debt coming into the equity, it can help create more cash flows for the company. Also, at the same time this strategy can help improve the company's managers' work efficiency and reduce unnecessary consumption. Another advantage is that this can save some money on some risky and low-efficiency project. By contrast, the advantage of lower debt like the strategy that Tesla and Mercedes Benz are using can do some help to the manager. Unlike the manager in BYDDY that need to care about the risk of investing an uncertain future prospect, managers in Tesla and Mercedes Benz can spend some money on some project they are bullish in but in creditors' perspective taking a lot of time and money and not certain if they could get their money back.

2.1.2 D/E Ratio

Next one is the D/E ratio. In this perspective, Tesla and BYDDY have a relatively low D/E ratio, which is 0.21 and 0.29, comparing to Mercedes Benz's data 1.36. With the number of D/E lower, the company can be easier to pay their debt. But there comes another problem is the companies with low D/E ratio may be lack in some expansion projects that need to be stimulated so there won't be too much loan or the company does not play a very important role in the car-making industry. From the data above it can

be found that Mercedes Benz do play a very important role in this industry, taking the quantity sold and the demand from the consumer into account.

2.1.3 Marginal Tax Rate

Marginal tax rate actually can find out corporate taxes accounted for how much percent of total revenue and how much percent of money they can get from the total revenue. Mercedes Benz has a marginal tax rate of 30.11 and comparing to Tesla's 11.02 and BYDDY's 12.19 it can be clearly seen that Mercedes Benz pay much more tax than Tesla and BYDDY. This also result in two reasons. One reason is that Tesla and BYDDY get tax subsidy from the government because of the field these two companies are concentrated in, which is the new energy field and Mercedes Benz still put traditional cars in a dominant position. The other reason is that Tesla and BYDDY have a relatively higher market value of debt and higher market value of debt can help make a bigger tax shield to avoid paying more taxes.

2.1.4 Equity Beta and Asset Beta

Then the equity beta and the asset beta. Equity Beta is a risk index that measures the price volatility of an individual stock or stock fund relative to the entire stock market. BYDDY has an equity beta of 0.65, lower than Tesla which is 2.12 and Mercedes Benz's 1.35. This cause a benefit to BYDDY because with a lower equity beta, BYDDY's stocks are stable relative to the performance benchmarks. When there is financial distress or the fell of the stock market, this can reduce losses easier. However, this means that Tesla and Mercedes Benz can multiply their market yield when there is more financial income due to their greater volatility of stocks relative to the performance benchmarks. Correspondingly, losses will be higher as a result of greater volatility of stocks. Therefore, Tesla and Mercedes Benz's shareholders have a higher risk while BYDDY's shareholders can have a relatively lower risk.

Asset Beta is the beta of a company without the impact of debt. It is also known as the volatility of returns for a company, without taking its financial leverage into account, because BYDDY make the company's market value a debt a relatively important role in the company's capital structure, so the asset beta of BYDDY, which is 0.44, is much lower than Tesla's 1.24 and Mercedes Benz' 1.78.

2.1.5 Return to Asset

The "rA" in the table refers to "return to asset". A higher indicator means that corporate assets are being used well, and it shows that enterprises have achieved good results in increasing income and saving funds. BYDDY has a relatively lower return to asset, 5.62. On the contrary, Mercedes Benz and Tesla have a return to asset at 9.9 and 8.6. This may also link to the position of their product. BYDDY choose to sell their product at medium and low-end market. However, most of the consumers that Mercedes Benz and Tesla are targeted on middle and high-end market so the profit that BYDDY get may be lower than the other two companies and manifest on a lower return to asset.

Table 2. Subsidies that BYDDY and Tesla get from some counties and cities

Country/City	Time Period	Types	Amount
United State Federal	2000–2022	Subsidies, tax breaks, etc.	340 million dollars
United State	2007–2022	Subsidies, tax breaks, etc.	2.17 billion dollars
United State	2007–2022	Loan, venture capital	470 million dollars
Shanghai, China	2019	New energy vehicle subsidies	2.1 billion dollars
China	2020	Cash grants, loan	85 million dollars
Germany	2021	Battery factory subsidies	1.14 billion euros

2.2 Government Subsidies

This part is about some government subsidies. This is a table about the subsidies that Tesla gets from the government, many countries have given a lot of subsidies to Tesla. For example, the United States federal has been given subsidies and tax breaks to Tesla since 2000 and the amount of money has come to 340 million dollars. Also, U.S. state has given 2.64 billion dollars to Tesla from 2007. Shanghai gave 85 million to help Tesla. There are also 1.14 billion euros used by the German government to help Tesla with their battery factory (Table 2).

In 2021 BYD gave the new energy vehicle subsidy income in the financial report, showing that the company's new energy subsidy income in 2021 will total 5.867 billion yuan.

Form the data above, it can be clearly seen that now new energy is playing a very important role in our daily life and governments have put a lot of money into this field to find a way to deal with energy issues.

3 Analysis

3.1 Strength

BYD's market advantages are as follows. First, BYD has always insisted on independent research and development and innovation. This is the principle that BYD has established since its inception. For example, BYD's battery, one of the core technologies of new energy vehicles, has unique advantages in the research and production of lithium batteries. This helps BYD reduce production costs. Not only that, due to China's large population base, the price of labor is relatively cheap. Therefore, BYD did not choose an extreme mechanized production line, but chose a production process of machine and labor. This further reduces production costs. Second, BYD has huge market potential in China. Although China's total car ownership has always been at the top of the world, China's per capita car ownership is far from that of developed countries. But the good news is that with the continuous improvement of China's per capita income and consumption level, people's purchasing power is also increasing, BYD's pricing and positioning are more suitable for most people to buy, and the future sales of BYD are

worth looking forward to [2]. Third, the Chinese government's support for BYD. The Chinese government attaches great importance to BYD's new energy vehicle industry. In 2019, the government arranged funds of 3.3 billion yuan for subsidy distribution, of which BYD, as the "big winner" of this subsidy, was 4.36 billion yuan, accounting for about 31.83% of the total subsidy amount. The second-ranked BAIC received 1.71 billion yuan. Not only that, BYD has received the most annual new energy subsidies for many consecutive years, which also shows BYD's leadership in the field of new energy in recent years and the government's attention to it [3]. And Taiyuan, a city that started out with coal, swapped all its taxis for BYD electric cars in 2016. The strong determination and financial resources of the Taiyuan government have led to the introduction of a high subsidy policy: the subsidy for passenger cars is usually the same as the national subsidy by the local government, but the Taiyuan municipal government subsidizes twice the national subsidy, and the rental company also subsidizes it. Got one. The last 300,000 car, the driver only needs to spend 87,500 yuan to get it. Local governments are also constantly encouraging the production and marketing of new energy vehicles [3]. For example, BYD, some local governments will give certain subsidies to consumers who purchase BYD new energy vehicles (BEV, PHEV).

3.2 Weakness

Of course, BYD also has many weaknesses at present. The first point is production technology. It is undeniable that BYD's production technology and innovation capabilities are among the top in China. But compared with the more mature auto industry in developed countries, BYDs technology is still relatively backward. BYD's insistence on independent research and development and innovation has led to some gaps between it and some international technologies. BYD has not done a very good job of absorbing cutting-edge technologies from around the world. Compared to Tesla, Tesla has partnerships with many other companies. Nearly 50% of Tesla's batteries are supplied by CATL and LG. The Tesla motor is provided by Nidec Corp. These world's top manufacturers have helped Tesla to excel in vehicle quality. And this is what BYD lacks [5]. Second, BYD lacks the global market. BYD's dominance in the Chinese market is strong, and sales of new energy vehicles can surpass Tesla's. But from the perspective of the global market, BYD still has a long way to go. BYD's commercial vehicle sales in 2021 will be 10,000 units, a year-on-year decrease of 5.6%, of which passenger car sales will be 6,000 units. Despite the impact of the epidemic, such sales are obviously unsatisfactory. In contrast, Tesla not only dominates the new energy vehicle market in the United States, but also in overseas markets, Tesla's sales are also the world's first, far surpassing BYD. According to statistics, in 2021, the global registered sales of new energy vehicles will be 6.5014 million. Tesla will sweep the world and win the global sales with a sales volume of 935.7 thousand, which is 1.6 times that of BYD, which is ranked second. The global new energy passenger vehicle market accounts for 14.4%, and the proportion in the pure electric market is as high as 20.3%. Although it is unfair to directly compare BYD and Tesla, these data can also reflect that BYD still has a lot of deficiencies in the global market. Third, China's domestic supporting facilities for new energy vehicles are not comprehensive enough. There is still a certain gap between China and the international top level in the development of new energy vehicles. For

example, charging piles, maintenance and other aspects have not formed enough scale and reached a high quality.

3.3 Opportunity

Due to the increasing damage to the environment caused by traditional cars, the largest cities in China are the most polluted cities in the world published by the World Bank [6]. And people are gradually realizing the advantages of new energy and the shortcomings and limitations of traditional energy. Therefore, the development of new energy vehicles is imminent and people are more able to accept different applications of new energy. As mentioned in BYD's advantages, China has a lot of subsidies for BYD. This also shows that the development of new energy vehicles has become a national development strategy, and there will be a steady stream of policy and financial support. Therefore, to sum up, the development market of new energy vehicles will have good industry prospects and momentum in the future [7]. Second, new energy is an emerging industry, and there is not a big gap in the development of various countries. Unlike the traditional automobile industry, it is unrealistic for China to catch up with some developed countries, such as Germany, in a short period of time. However, in terms of new energy vehicles, although there is still some gap with the top of the world, the gap between BYD, the leader of new energy vehicles in China, and these countries is not very big. Moreover, national policies, market prospects, etc. all show a lot of opportunities and great potential that BYD has [2].

3.4 Threat

Although it has been mentioned that BYD is the leader in China's domestic market, it faces many challenges, such as Beijing Automotive Group or Geely, which are also vigorously developing new energy vehicles. After all, the potential of the Chinese market is huge, and every company is doing its best to maximize its own interests. This kind of competition is not only in terms of product quality, but also in terms of product after-sales and marketing strategies [2]. Not to mention foreign brands, such as Tesla, BMW, and Volkswagen. If BYD is a little slack in R&D and marketing instead of constantly innovating and improving, it will be replaced by these domestic and foreign brands at any time. Moreover, some barnds like Tesla also receives subsidy from different countries. Various government subsidies (including tax breaks, loans, etc.) won by Tesla in the past 20 years are nearly $3 billion and In China, Tesla received 2.1 billion yuan in subsidies for new energy vehicles in 2020 alone. In other words, The advantages of BYD due to subsidy are not as big as thought [8].

3.5 Conclusion

In general, through SWOT analysis, BYD's advantages and opportunities lie in the huge potential of the Chinese market, the strong support from the government, and its relatively advanced independent R&D and innovation capabilities. But there are also many problems, such as the gap with the world's top technology, too little cooperation

with foreign top auto parts manufacturers, and the lack of global market. Not only that, BYD also needs to make continuous progress so as not to be overtaken and replaced by many excellent new energy vehicle brands at home and abroad.

4 Risk Analysis

Since 2016, BYD's new energy passenger vehicle sales have gone through three stages. Due to BYD's lower positioning and more industries, the overall sales in the past few years have maintained an upward trend. 2016–2018 is a period of rapid growth, with monthly sales rising from 5,000–6,000 units to more than 30,000 units; 2018–2020 is an adjustment period in the first half of 2020, with monthly sales fluctuating between 10,000 and 30,000; The product was launched, and the monthly sales exceeded the previous highest value. It has also climbed to 106,000 units in a single month due to the strong sales of DM-i and the launch of new vehicles with a new 3.0 pure electric platform [9].

BYD's idea has little disruptive effect on the electric vehicle industry, thus pose little creativity to the market. Also, there are many paths in the electric vehicle industry, such as hydrogen batteries, lithium iron phosphate batteries and ternary lithium batteries. With the rapid development of technology in this regard, BYD may be excluded by other brands because it has not caught up with the latest development. Moreover, the electric vehicle industry is not yet mature, and too much research and development expenses have caused this profit margin to decline.

It is obvious that COVID-19 has posed a great threat to BYD's development. Firstly, the epidemic has led to lower-than-expected industry demand, which may have direct impact on its sales. Secondly, serious global inflation make the costs of manufacturing surge. Due to COVID-19, BYD has entered a medium-to-low-speed growth period with prominent cyclical volatility. After three consecutive years of declines, under the unfavourable situation of rising costs and chip shortages, total car sales have resumed growth led by passenger cars, while commercial vehicle sales have declined. The upstream supporting facilities of China's automobile industry are relatively complete, especially in the development of new energy vehicles, power batteries have a certain leading advantage in the world. However, since the second half of 2020, the insufficient supply of automotive chips has formed certain constraints on the production of major auto manufacturers; China's automotive chips are highly dependent on foreign countries, and there are certain hidden dangers. From the perspective of demand, in recent years, the preference for SUVs and mid-to-high-end vehicles has been fully demonstrated in the Chinese market, and with the changes in consumer groups, the market recognition of new energy vehicles that can carry the functions of "intelligence + network connection" has increased rapidly; my country's own brands Manufacturers gain advantages in SUVs and new energy vehicles, narrowing the gap with joint ventures [10]. There is a great correlation between the purchase demand of trucks and the scale of infrastructure investment and the total amount of social logistics. my country's recent active fiscal policy and large infrastructure investment scale are conducive to the stability of heavy truck sales; The implementation is expected to maintain the growth of light truck purchase demand. Affected by factors such as the expansion of rail transit network coverage, my country's passenger car market is facing greater pressure, and has been in a saturated

state in recent years. In the future, market demand will mainly rely on policies to promote the electrification of vehicles in public areas and public transportation in third- and fourth-tier cities. The outlook remains to be seen.

As a capital-intensive industry, the automobile manufacturing industry is highly concentrated. After the survival of the fittest since 2018, most of the bond issuers in the industry are leading companies, with significant advantages in scale, overall good financial performance, and generally high credit ratings. In 2021, there will be no default or deferred payment of bonds in auto manufacturing companies, and the main credit rating of one company has been downgraded; the scale of newly issued bonds is small and the coupon rate is low; the scale of existing bonds and the repayment pressure of bonds due within one year are small. Looking ahead, in the short term, my country's auto manufacturing industry is expected to continue its growth trend in 2022. In the medium and long term, on the one hand, the decrease in demand growth will intensify the competition in the industry, and the living environment of disadvantaged companies will continue to deteriorate; It is expected to operate stably as a whole, which is conducive to the basically stable credit level of most existing bond issuers.

With the application of various automation functions in automotive products, a wide variety of chips have long become important electronic components required for automotive production. Especially in recent years, in the process of accelerating the development of "electricity + intelligence", the automotive industry has The demand for chips is growing rapidly. However, at the same time, due to the COVID-19 epidemic affecting the normal operation of some chip companies, some fabs suffered accidents, and the inaccurate demand forecast of chip manufacturers after the change in the pattern of manufacturers in the automotive industry, as well as market hype, stockpiling and other factors, Since the second half of 2020, the shortage of global automotive chip supply has been highlighted, and the price of automotive chips has skyrocketed and the delivery cycle has been prolonged.

In terms of price, since the second half of 2020, the price of some chips has risen by more than 10 times; in terms of delivery cycle, according to a research report by market analysis agency Susquehanna Financial Group, the normal delivery cycle of chip manufacturers in general years is between 10 and 15 weeks., From the second half of 2020, the delivery time of chip manufacturers will gradually increase, and 2021 will be significantly longer than normal years, and it will be about 25 weeks by the end of the year. Since chips account for a small proportion of automobile production costs, the impact of rising chip prices on the automobile industry is still controllable. However, due to chip shortages, most domestic and foreign automobile manufacturers are forced to reduce production in stages. From April to August 2021, my country's automobile production continued to decline month-on-month. Due to the country's crackdown on market hype and the gradual placement of pre-orders, the supply of chips has eased slightly since September 2021, and my country's automobile production has increased month-on-month, but it still cannot fully meet market demand. In the second half of 2021, my country's automobile production was 13.513 million vehicles, a year-on-year decrease of 10.59%; the inventory at the end of the year dropped from 1.019 million vehicles at the end of the previous year to 845,000 vehicles.

At present, my country's automotive chip products are highly dependent on foreign countries (more than 95% need to be imported).

After analysing the risk of BYD, it can be summarized as following: externally, intensified competition, financial risk penalized by COVID-19, little brand global effect, the reduction of state subsidies; Internally, capital structure, the branches.

5 Conclusions

In general, as an excellent new energy vehicle brand in China, BYD has good independent innovation capabilities and production capabilities. At the same time, because BYD's product positioning is in the mid-to-low market and its market distribution is concentrated in China, its investment risk is lower than that of other international brands, such as Tesla and Mercedes-Benz. But this also means that BYD's earnings will be lower. Not only that, BYD's advantage lies in China's relatively cheap labor, a market with great potential, and strong support from the national government. And new energy is an important development direction in the future, and BYD's future development prospects are also huge. But there are also many threats, such as threats from different brands at home and abroad. BYD has been hit by lower demand for cars under the influence of the COVID-19 outbreak. Moreover, BYD's high dependence on foreign automotive chips is also a major problem. Therefore, the suggestion for BYD is to strengthen cooperation with other brands on the premise of adhering to independent research and development and innovation. Reduce manufacturing cost. Strengthen global sales layout and expand consumer groups, thereby expanding market competitiveness.

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