

Valuation and Industry Analysis of New Energy Vehicles

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Abstract. With the increasingly harsh global environment, the new energy industry has received strong support from national policies. On this basis, the enthusiasm of relevant departments and enterprises for the new energy industry has increased. This paper discusses the development of new energy vehicles by analyzing the development status, market development prospects and limitations of new energy vehicles. In addition, we conduct a corresponding valuation analysis of BYD Automobile, which is a leader in the new energy vehicles of China. According to the analysis, the intrinsic value of BYD's stock will be lower than its stock value, indicating that the investment value is higher perceived at this stage. As a consequence, the investment in BYD nowadays ought to be reduced in the future. These results shed light on offering better understanding of the development status and limitations of new energy vehicles, as well as providing a guideline for investment evaluation of the industry.

Keywords: New energy vehicles; Development status; Valuation analysis; Industry analysis.

1. Introduction

Contemporarily, various types of new energy vehicles (NEV) have been proposed, such as hybrid vehicles, pure electric vehicles [1]. In particular, its advantages of ecology, environmental protection and energy conservation have been paid more and more attention by the state. New energy vehicles are constantly growing in the voice of doubt and support, and by 2021, China's new energy vehicle sales will increase by 157.8% year-on-year, and it is expected to increase by 42% year-on-year in 2022 [2]. This year's subsidy policy is about to usher in a new adjustment, new energy vehicles will continue to take the policy-oriented direction, or begin to embark on the market-oriented, has become a hot topic of concern in the industry.

The obvious increase in plug-in hybrid vehicles and pure electric vehicles has become a popular research direction, which can well save the energy consumption of deceleration and downhill process during the process of automobile travel, while its displacement is low and pollution is small. Pollution generated by the production of electric vehicle electricity and the manufacture of batteries can be centrally treated and zero emissions can be achieved. The intelligentization of new energy vehicles is also popularly studied, such as: the Internet of Vehicles communication technology, regenerative braking energy recovery technology, vehicle intelligent driving and dynamic control, automobile navigation, and the electronic and automatic transmission.

For the sake of analyzing the willingness of domestic and foreign consumers to purchase NEV, the manufacturing of NEV by enterprises and the policy support of the government. In the whole article, we will introduce the current development of NEV primarily, e.g., the views of consumers on NEVs, the sales of NEVs and the revenue of new energy vehicle enterprises. Secondly, we will conduct valuation analysis on a specific company (e.g., BYD automobile company) [3]. Then, we will discuss the limitations of the development of NEV and propose the prospects for their future. Finally, a final summary will be presented of the research on new energy vehicles.

2. Development of NEVs

In China, the development of new energy cars in our country started relatively late compared with other developed countries (e.g., America and Japan), China's new energy cars have only begun to develop under the support of government policy since 2008. After 14 years of hard development, China has made remarkable progress in the technology of new energy cars. To be specific, in terms of power, it has developed from traditional pure electric power to oil electric hybrid power. In terms of core components such as motor, it greatly increases its safety and stability. Contemporarily, there are some very mature parts suppliers in China. Regarding to products, it also has the strength to compete with the traditional new energy automobile manufacturing powers. Only 80,200 NEVs were sold in 2011. In 2021, the annual production and sales of China's new energy cars market exceeded 3.5 million. At the same time, the sales of Chinese brand passenger cars continued to rise steadily, with a year-on-year growth of 23.1%, and the annual market share of 44.4%, close to the best level in history [4]. As illustrated in Fig. 1, the current development process of domestic new energy vehicles, the structure of pure electric vehicles is more balanced, and the compact and SUV are gradually expanded. In January 2021, the output of minicars accounted for about 41.4%, the largest proportion in the whole year. The volume of compact and SUV vehicles is gradually increasing. In December 2021, the proportion of SUV has reached 30.1%, which is close to that of minicars, and the model structure is more balanced. The growth momentum of the output of mini models has weakened, and the proportion of the output of SUV, medium-sized and medium-sized models will increase in 2022 [5].

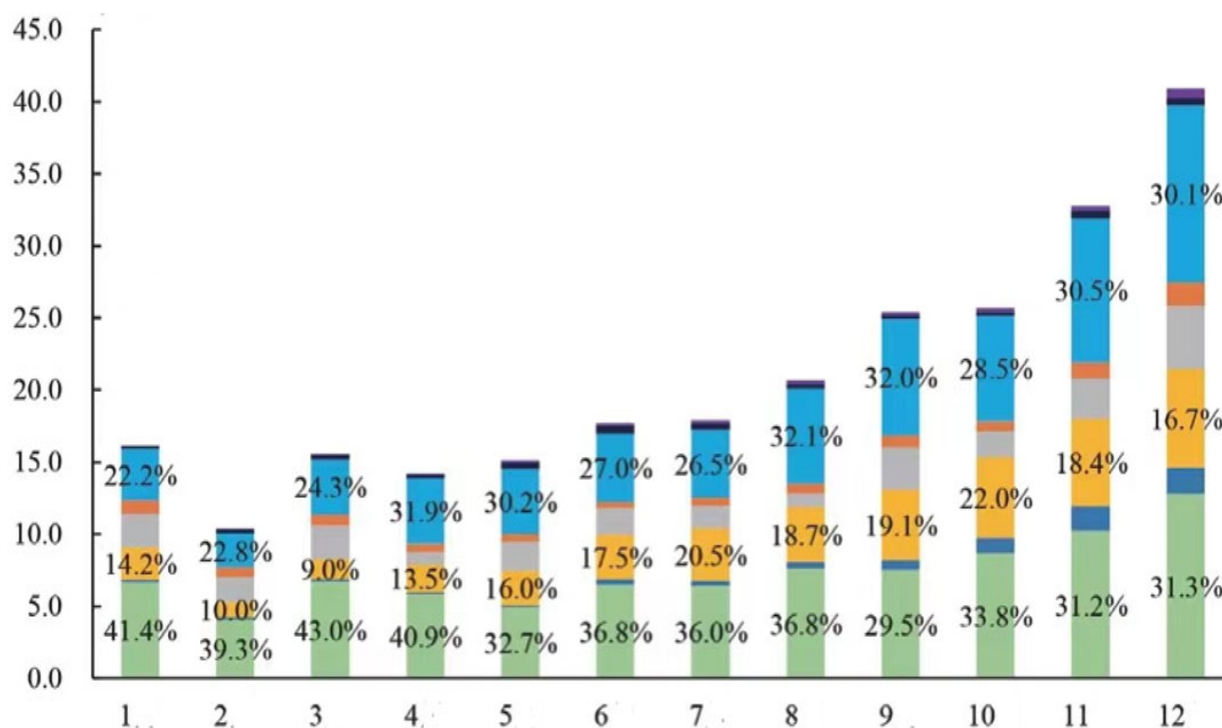


Fig. 1 Volume and proportion of different models in 2021. The green, blue, yellow, gray, orange, cyan, purple parts represent for micro, small, compact, middle, minor large, SUV and MPV vehicle, respectively.

As shown in Table. 1, Xpeng ranks first with 98155 sales, with a year-on-year increase of 263%. NIO and Ideal rank second and third, with their sales exceeding 90000 [6]. Nevertheless, there is still a lot of room for progress in the production of new energy cars, whether in the production of parts or in the manufacturing of complete cars. At present, fuel cell cars in China are mainly used on cars and other large buses, but rarely on small cars, the reason is that buses are large enough and convenient to carry hydrogen storage bottles and fuel cell engines [1]. Meanwhile, for passenger cars, research and development technology is more difficult due to the high production cost. In this case, there is no

mass production and market related models in China. In addition, another important factor restricting the development of new energy cars is the layout of charging stations. There are still some places in China that failed to popularize charging stations. Therefore, it is not convenient to use them, i.e., China's new energy cars still need some time to develop and progress [7].

Table 1. The sales volume of new forces of car building ranked top 5 in 2021 (vehicles)

ranking	brand	sales volume	Year on year
1	XPENG	98, 155	263.0%
2	NIO	91, 426	109.1%
3	LEADING IDEAL	90, 491	177.4%
4	Neta	69, 674	361.7%
5	WM	44, 157	96.3%

In foreign countries, the United States focuses on plug-in hybrid electric cars, and support the development of new energy cars through government procurement, demonstration operation, legislative norms, back slope subsidies, tax credit and constantly improving the credit mechanism. In 2013, the US Department of Energy released the EV Popularization Blueprint, which set out the country's research and development path in key technologies such as power batteries and electric motors for electric vehicles in the next ten years [7]. In September 2017, the sales of NEVs in the United States reached 21282 increase of 29.19% compared to 2016. The cumulative sales reached 142471, with a year-on-year increase of 31.18%. In October 2018, the sales of new energy cars in the United States was 313000, with year-on-year increase of 56.6%. The Japanese government has adopted various measures, such as car purchase subsidies and layered construction of charging facilities, to develop new energy cars [2]. Develop three types of electric vehicles in an all-round way, and its sales volume of hybrid electric vehicles is the first in the world. In terms of charging infrastructure, Germany had 6,517 public charging facilities in June 2016, rise 10 percent from the end of 2015.

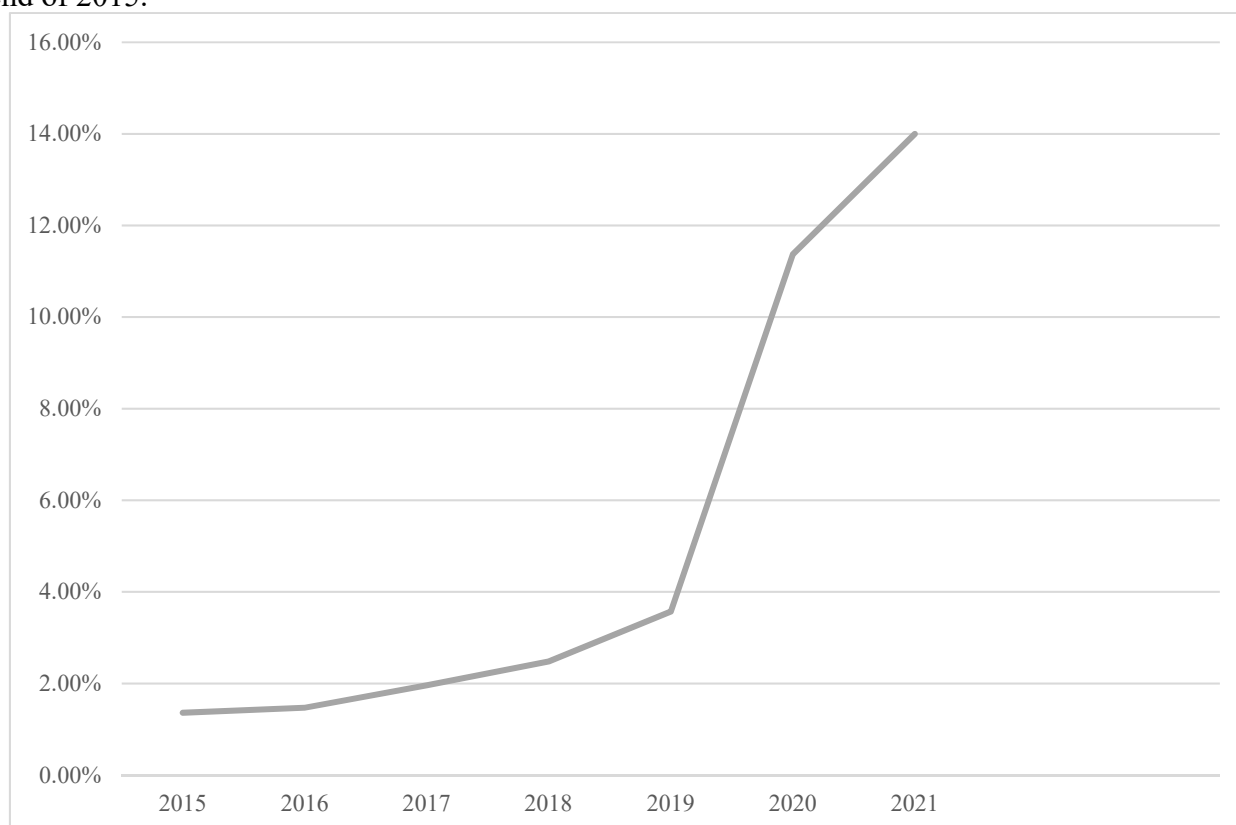


Fig. 2 Penetration rate of NEVs in Europe from 2015 to 2021

3. Valuation analysis of BYD

BYD is a high-tech enterprise focusing on battery and vehicles manufacturing, which has already been listed in Hong Kong and Shen Zhen, with total market capitalization of more than 100 billion yuan [8]. Earnings per share and net income decreased in 2019 compared to 2018, as listed in Table. 2. earning per share decreasing 0.93 to 0.5, net income decreasing 278091 to 161445, but earning per share rose sharply in 2020 to 1.47, net income to 423427. Earnings per share and net profit declined in 2021 owing to COVID-19, but the outlook is promising compared with 2019 and 2018.

Table 2. Financial statements of BYD

	2021/12/31	2020/12/31	2019/12/31	2019/12/31
Net profit (10000 yuan)	304519	423427	161445	278091
Main operating income (10000 yuan)	21614240	15659769	12773852	13005471
Main operating profit	2510983	2819190	1925364	1918374
Earnings per share (yuan)	1.06	1.47	0.50	0.93

Following the dividend discount model (DDM model), the price of BYD can be estimated as bellow [9]:

$$V = \sum_{i=0}^{\infty} \frac{D_i}{(1+k)^i} = D_0 \sum_{i=0}^{\infty} \frac{(1+g)^i}{(1+k)^i} = \frac{1+k}{k-g} D_0 \quad (1)$$

From the financial report given by BYD in 2022, it can be seen that the earnings per share (D_0) is 1.1, the growth rate(g) is 5.5%, and the risk-free interest rate(k) is 6%. Therefore, the intrinsic value of BYD automobile shares is 232.2. According to the final calculated data, the intrinsic value of BYD Auto stock is 232.2, which is lower than the current stock price of BYD 319.39, indicating that the stock is overvalued by the market. Therefore, investment in this stock should be reduced in the future.

4. Limitation & Future prospects

The new energy automobile has lots of advanced science and technology, but the automobile itself also has some limitations [10]. Hence, these limitation is the first factor that leading new energy automobile cannot become the main cars. Apparently, the first shortage is the continuation of the journey, which is also the most trouble problem. Although battery technology how perfect is it, but it still cannot compare with the fuel vehicle's continuation of the journey. All new energy automobile can't say for sure that the original electric engine of cars will last until the cars are scrapped. From 2016, the government has some stipulation of new energy automobile like automobile company must provide the quality guarantee of 8 years or 120000 kilometers.

In addition, the second problem is charging. The new energy automobile need to charge anytime. Now most cities have public charging station, but the price will change at different part of time quantum. The highest price is at the peak time. However, when getting to the charging station, one may be don't have the spare place for people to charge, as lots of people want to charge at the same time. Besides, it is not very support that community has own charging box for the people who charge at home. Meanwhile, the city don't have enough charging station that some drivers cannot find the station easily. If the station as the same as the fule vehicles, people can save a lot of time.

Last but not least, the problem of self-igniting cannot be ignored. The new energy automobile also happen this condition. Some automobile stop normally on the road with high temperature, may be the automobile will self-ignite and others will happen at the charge station and self-ignite is very awful. It will not only bring some property loss to drivers but also bring some safe problems [11]. Many consumers don't choose new energy automobile, because they are afraid that the new energy automobile suddenly self-ignite. Moreover, our country's technology still has some disadvantage because many business don't master the important part of technology. Besides, the inland industries start later than others. The industries don't have enough experts to check the quality. Thus, they need to buy some key component from other countries [12].

To address the issues mentioned above, the government also have some future looks on new energy automobile. Following the evolving the science, the technology will be improved definitely. Maybe the new energy automobile will become the first choice to consumers [13]. In addition, with the local laws and regulations, the main body of automobile consumption change, the subsidies away of new energy automobile etc. The development of new energy automobile will straight increase in the 5-10 years, may be can reach trillions of benefits and become the large industries in the world. In the future, the technology of product will become mature gradually, which improves the lifetime of battery and reduces the battery costs, as well as uses better component to produce and optimizing the quality of small parts. At the same time, develop and research advanced technology (e.g., the warning of fault prevention and the intelligent healthy battery monitoring) can be implemented. Paying more attention to the automobile's safety, corporations need to do a good job in prevention and complete the facilities and service. It can improve the safety of new energy automobile and let more consumers trust the automobile. More and more people will know the new energy automobile in the future and business will improve the new energy automobile market to develop abroad [14]. This can rise the development of China's automobile globalizaion and increase the sales of new energy automobile. Thus, the new energy automobile will become the mainstream in the future.

5. Summary

In conclusion, this paper discusses new energy vehicles from the perspectives of valuation analysis and outlook. Nowadays, new energy vehicles have become one of the topics that countries often concern about, and many scholars have also published relevant articles to elaborate. Therefore, we synthesized the views of different scholars and offer a comment on new energy vehicles. The main content of this paper is the development and limitations of new energy vehicles at home and abroad, and the value evaluation of related enterprises. From the whole article, at present, new energy vehicles have a good development trend at home and abroad, and the sales volume is also increasing year by year. However, it also has some disadvantages, such as long battery life and imperfect infrastructure. In the future, although new energy vehicles still have some defects, new energy vehicles will have a good development trend at home and abroad in the future, and their sales will increase year by year. Meanwhile, through the calculation of the intrinsic value of BYD automobile stock, it is concluded that the investment in BYD automobile enterprises should be reduced at present. In general, these results provide buyers with relevant information about the new energy vehicle industry. Thereby, they can better understand the development and limitations of new energy vehicles. These results also provide investors with the valuation of BYD's stock for reference.

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