Corporation Valuation aiming at Financial Investment Purpose on Contemporary Lithium-ion Battery Manufacturer Giants

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Abstract. The importance of lithium-ion battery manufacturing is obvious in the current modern economy. As automobile manufacturers are considering environmentally friendly solutions, there are several giant lithium-ion battery manufacturer companies that have started to dominate the market. However, from the perspective of investors, it is harder for the public to understand the hidden clues behind the news and financial reports. By applying functions and indexes to the data provided in the annual financial report, the paper is aiming to analyze the potential profitability and risk within the firms to help the public with more specific and objective financial investment suggestions. The main factors that will affect the investment opinion being discussed in the text are the leverage ratio and beta asset (financial risk). Comparing the difference and meanings of these factors, the statistics would become vivid and understandable. As the conclusion suggested, every company could have its pros and cons. With higher risk, there is also a higher return accompanied. It would be critical for the investor to evaluate their level of risk tolerance and choose the company that fits their preference.

Keywords: Lithium-ion battery; Company valuation; Business risk; Investment decision.

1. Introduction

1.1 Background

While the carbon emission problem that led to global warming has become an undeniable fact, automobile manufacturers are also moving their concentration to electric vehicles that are more environmentally friendly to the planet. One important factor for these automobile manufacturers to consider is the supplier of lithium-ion batteries for the vehicles. Based on previous research by others, the necessity of lithium-ion batteries is clear and obvious to the public. However, for general investors, it is sometimes difficult to find the company that is trustworthy and worth investing in.

In this paper, analytics are conducted to compare the three major lithium-ion battery manufacturers around the world China, Korea, and Australia. From the variety of their business to the operation conditions of the companies, this research will take an objective stand to decode the hidden investing clues in their financial reports.

1.2 Related Researches

Considering the existing issues with climate change and environmental protection, the entire automobile industry is looking for a more environmentally friendly solution for vehicles. Manthiram discussed the capability of lithium-ion batteries in the electric vehicle market. Just like most other batteries, contemporary lithium-ion batteries are activated by the cathodes and anodes insertion-reactions. However, Manthiram is still looking for an alternative solution that is safe, longline, and affordable. It addressed the ability of lithium-ion batteries in the market from the outlook of the current technology and inevitable challenges along with the development process [1]. Zubi et al. mentioned the point that lithium-ion batteries are getting more important in modern society. Besides the application of automobiles, it could also be used in other fields. However, there is still an underexploited field of lithium-ion batteries in the power supply system, which could greatly increase the efficiency by combining with photovoltaics and wind power. The future of lithium-ion batteries

can be highly expected with the new innovative technology support to pave the way for the industry [2]. Zeng et al. discussed the ongoing opportunities and challenges in the current Chinese lithium-ion battery market. While the lithium-ion battery brings convenience to the modern lifestyle of people, it could also lead to potential environmental and health risks. To solve these challenges, they suggested three critical approaches: setting new regulations to manage Lithium battery recycling, establishing a collection system for CE and EV battles, and emphasizing new technology for lithium better recycling while solving the large quantities of previously stored wasted lithium batteries [3].

With a great passion and expectation on the industry of lithium-ion battery technologies, Kim et al. discussed the already existing facts, potential future outlook and outreaches of hybridized technology, which could be the next significant industry influencer in the field. To fulfill the future high demand for batteries, they suggest a type of stand-alone energy device, which combines energy storage technology with the lithium-ion battery [4]. With the concern for future environmental problems and the increasing number of batteries consumed every day, current scientists had also struggled to find solutions to deal with the problems. One of the solutions is the battery recycling process that allows the industry to recollect the used batteries and reuse them in the future. However, this solution would also be challenging since it has to be commercially viable. Yang et al. proposed the viability of the solution by providing statistical data and research support [5].

In related research, Virlics found that the financial investment decision as a subjective action is controlled by both subjective and objective factors. Meanwhile, Virlics also proposed the idea that business risk related to the investment would also be critical for the final decision of the investors. While the investors are evaluating the risk and payoff from the investment, their decisions are also determined by behavior economics which involves psychological and emotional factors. And further researches on these subjective factors are needed since there is always a need for an elaborated decision-making experience [6]. Porta et al. mentioned the point of investor protection related to corporate valuation. To support their argument, the researchers suggested a model that collected results from 539 large sample firms. As the tested sample firms come from over 27 wealthy economies, the model becomes a fair and objective presentation of the impacts of minority shareholders who are under legal protection compared with other dominant shareholders who also hold a great cash-flow ownership. And as a result, this research indeed finds the definite impacts between the two compared groups [7]. As inventors, people generally have a tendency to avoid risk. According to Kimball, this is considered standard risk aversion. He discussed the basic concept and supported his argument with research. Emphasizing that an undesirable risk will continue while the independent undesirable risk exists in the circumstance [8]. Esqueda et al. presented the concept that government contracts would also cause a significant impact on corporate valuation. Through research, they found out that the government contractors have a tendency of lower cost of equity. Surprisingly, these government contractors could also have a higher valuation in strategically-important industries since there is better operating performance in these fields [9].

Abidin et al. proposed the impacts on firm performance through analysis of levered and unlettered beta. They mentioned that a firm’s performance is a combination of Return on assets(ROA), Return on equity(ROE), and Tobin's Q. These three main factors played an important role in the valuation as independent variables, and they are mainly affected through the performance of the firm. On the other hand, levered and unlevered beta play the role of independent variables. While the unlevered and levered beta are considered as dependent variables, it is also important for the managers to make decisions with the consideration of the firm's specific capital structure and pitfalls hidden along the way [10].

1.3 Objective

Supported by relevant research that discussed the importance and viability of lithium-ion batteries used in automobile manufacturing and investment advice of different firms, this paper will introduce the three lithium-ion battery manufacturers around the world. Focusing on Contemporary Amperex Technology Co. Ltd from China, LG energy solution from Korea, and Piedmont lithium from

Australia, this research had driven all the data from their annual financial reports. By applying reasonable functions, investors will be able to have a clear understanding of the company's current performance and potential issues with its financial condition.

2. Method and data

2.1 Method

In the following data comparison and analysis, we used 8 formulas.

Firstly, to find the value of equity in the market, it is calculated by means of an online search. By gathering the data of the number of shares currently outstanding from financial reports, the data is multiplied with the current share price in the market.It is a dollar amount that can help you understand the overall weight.

The second number is the market value of debt. This is the amount of money a group of people are willing to pay to buy the debt instruments of this company, also considered as a kind of risk compensation. The lower the risk of the company, the lower the interest rate on the debt instrument, and vice versa.

$$\text{Market value of debt} = (\text{Numbers of debt instruments}) \times (\text{Current price per debt instrument}) \quad (1)$$

Leverage ratio is basically a ratio of an enterprise's assets and liabilities, from which we can see the percentage of the company's capital structure implying the ratio of borrowed capitals to existing assets. More generally, it can be seen whether an enterprise is profitable, and to a certain extent, it can express the size of the company's risk.

$$\text{Operating Leverage Ratio} = \frac{\%\ \text{change in EBIT} \times (\text{Earnings before interest and taxes})}{\%\ \text{Change in sales}} \quad (2)$$

Furthermore, the marginal tax rate changes according to the policy of each country or local government. For example, 25% in China and 17% in South Korea. The tax rate also increases with income, and earnings are divided into several parts, each of which is taxed differently. For example, in the United States, for Singles With Taxable Income Over $0 but less than $9,950, 10% should be paid, and for singles with taxable income over $9,950 but less than $40,525, 12% should be paid.

Equity Beta, also known as levered beta, can be used to measure market risk, because it is important to care about debt and equity when measuring whether a company or enterprise is worth investing in. The risk of a stock can be basically determined by the proportion of its financial debts to equity. A company whose debt rises while equity remains unchanged or even declines will usually have greater investment risk.

$$\text{Equity Beta} = \text{Asset Beta}\ (1 + \frac{D}{E}\ (1\text{-Tax})\ \text{Equity Beta} = \frac{\text{Covariance (Rs,Rm)}}{\text{Variance (Rm)}} \quad (3)$$

Cost of equity is the most basic data when people or companies want to invest, which is actually the expected return on investment.

$$\text{Cost of equity} = \text{Risk free return} + (\text{Beta}) \times (\text{Average stock return - Risk free return}) \quad (4)$$

Then, the expected cost of debt capital is the effective interest rate paid to creditors and bondholders by firms that lend or borrow money. It is the expected rate of return, expressed as a percentage, for firms providing credit and debt. And the pre-tax and after-tax are different, because the interest expense part can be tax deductible

$$\text{interest expense} \times (1 - \text{Tax rate}) \tag{5}$$

The WACC (weighted average cost of capital) refers to the tax-applied cost of capital for the company, no matter where it comes from. It also indicated the critical interest rate expected to be paid by the company through operation. Generally speaking, with a higher risk of the company, there is a higher risk for the investors. They will demand more returns, so the WACC of the company will be higher, so the value is determined by the investor or the investing company, not the company's senior leadership.

$$\text{WACC} = \frac{\text{Market value of equity}}{\text{Total value of financing}} \times \text{Cost of equity} + \frac{\text{Market value of debt}}{\text{total value of financing}} \times \text{Cost of debt (1 - Tax rate)} \tag{6}$$

Business risk is any factor faced by a company or organization that may reduce its profits or cause it to go bankrupt.

$$\text{Business risk} = \frac{\text{Equity beta}}{((1 - \text{Tax rate} \times \text{Leverage}) \,/\, 1 - \text{Leverage})} \tag{7}$$

Return on assets represents the profitability of a company relative to total assets. Investors and investment companies can also use it to determine how much profit a company can make with assets and the ratio of assets to profits. That is, it represents the profitability of the company. Therefore, the higher the value is, the higher the productivity of the company is and the more efficient use of assets is, and vice versa.

$$\begin{aligned}\text{All equity expected return on assets} &= \text{Risk-free return} \\ &+ \text{Business risk} \times (\text{Expected return on the market-risk-free return})\end{aligned} \tag{8}$$

2.2 Corporation Differentiation

Considering regional differences and competition among countries, we selected three companies: the first is Contemporary Amperex Technology Co. Ltd(CATL) in China, the second is LG Chem in South Korea, and the third is Piedmont Lithium in Australia.

Contemporary Amperex Technology Co. Ltd, with a headquarter located in Fujian, China, mainly focuses their business on electrical automobile batteries. At the same time, CATL had also extended its business line into the battery management systems and energy storage systems besides the development and production of lithium-ion batteries.

LG energy solution, owned by LG Group of Korea, is a global leader in battery technology. The business line of LG energy solution concentrated in mainly three fields, which are the power batteries like the lithium-ion batteries, small batteries with domestic usage, and also the energy storage system. Piedmont Lithium is the upstream company in the lithium battery industry. Mainly lithium metal mining, as well as lithium battery manufacturing and recycling.

3. Results and discussions

3.1 Statistical Analysis

Firstly, Piedmont lithium has the lowest market value of equity, which means that its stock is unstable and risky, but more flexible. However, considering the equity value of LG energy solution is also very low, mainly because the company is very new and was established in 2020. Regarding the market value of debt, although it seems that Piedmont's lithium debt is very low, it is mainly because the situation of the other two companies is different. CATL's debt is higher than equity and seems to be very risky, but it is China's top company and monopoly in this field, has few competitors, and there are many opportunities for innovation and development. LG energy solution is a new

company, and high debt means its high opportunity. There is also the marginal corporate tax rate. Because the debt ratio of piedmont lithium is very small, he also has to pay the most tax. The expected cost of equity of PPL is also very low, representing that the profits of investors will not be too high, and there will not be too many investors. Direct business risk is also the highest, up to 0.9. and PPL's All-equity expected return on asset is also the highest, probably because it is riskier, so the expected profit is also relatively high. Therefore, the risk premium below is also the highest.

Table 1. Financial results.

	PLL	CATL	LG ES
Market value of equity	6.96B	978.41B	56.83B
Market value of debt	0.046B	1321.23B	37.33B
Leverage ratio	0.66%	135.04%	65.68%
Marginal corporate tax rate(based on regulations in the headquarters country)	30%	25%	17%
Equity beta(including assumptions on expected risk-free rate and market risk premium)	0.91	0.87	0.91
Expected cost of equity capital(rE)	7.24%	9%	9.5%
Expected cost of debt capital(rD)	5%	5.50%	5.00%
Weighted average cost of capital(WACC)	7.09%	7.40%	7.00%
Business risk (βA)	0.9	0.43	0.85
All-equity expected return on asset(rA) implied by delevering equity beta	7.18%	3.50%	2.78%
risk-free interest rate	1.05%	3%	3%
risk premium	6.80%	4.15%	4.40%

3.2 Investment advice

If we only look at the operating income and net profit of CATL after listing, CATL is an enterprise with a shocking rapid growth in both financial and performance status. Back to 2018 when CATL had it IPO, the market value of CATL is about 5.46 billion yuan (RMB), and compare with the current market value of the firm of 487.3 billion yuan (RMB), with a significant increase of 90 times more than its IPO, it is not exaggerated to say that CATL had become the industry giant in a blink.

Therefore, from the perspective of growth, the performance growth of enterprises is far lower than the market value growth of enterprises. CATL's debt is higher than its equity, which seems to be a big risk, but it is China's top company and monopoly in this field, with few competitors and many opportunities for innovation and development. Its business risk is also the lowest among the three companies. Therefore, CATL is the best choice.

4. Conclusion

After the comparisons between the financial and statistical factors of CATL, LG energy solution, and Piedmont lithium, it is clear that CATL had become the least risky firm among the competitors. Due to its amazing performance in the global market and relatively trustworthy growth in the future, investors who prefer steadier growth might prefer CATL. However, this finding will never mean there is no highlight from the other two companies. While CATL has its drawback like the relatively high leverage ratio among the competitors, LG energy solution and Piedmont lithium are performing more attractively. Since the investors need to choose the company that fits into their expectations, there will be a choice of having high profit by holding greater risk and having less profit with less business risk. As mentioned at the beginning, this research aims to provide objective investing information to the public. Having the least business risk will never mean the company will be the favorite choice of investors. For long-term consideration, every investment in the company will lead to significant impacts and pave the way for a greater and stronger economy in the world.

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