



Research on the Evaluation of LONGi's Enterprise Value Based on DCF model

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Abstract. With the rapid development of solar photovoltaic industry, the evaluation of photovoltaic enterprises value becomes a hot issue. Under the background of COVID-19, it is also a remained problem that whether photovoltaic enterprises in NON-OECD countries such as China are worth to invest. To solve those questions, based on the existing researches, this paper takes LONGi as an example, using two-stage DCF model to make company valuation from forecasts of operation to discount of free cash flow. By comparing the value per share calculated with the price per share provided by market, this paper makes a conclusion that it is not a good time for conservative investors to invest in. This paper provides a case study in NON-OECD countries for investment in photovoltaic industry during COVID-19, and reflects the market's appreciation on the development of Chinese photovoltaic industry which means the industry has potential and it is worth to observe constantly in the future as a long-term investment choice.

Keywords: DCF model, LONGi, value assessment, solar photovoltaic industry

1 Introduction

With the rapid development of economy, the demand for electric energy is increasing around the world. Solar photovoltaic industry, which holds good potential and grows up quickly, has become a hot spot in human society today. Out of various purposes and consideration including investment and national strategies, people start to reassess the status and value of solar photovoltaic industry rationally. In China, solar photovoltaic industry has developed rapidly, accounting for more than 70% of the whole world's capacity since 2013 [1]. Driven by a huge domestic pipeline of PV projects, installations are expected to exceed 75GW in 2022. It is unavoidable to take China into account when discussing related topic on solar photovoltaic industry, considering the capacity of the market and the powerful solar enterprises it has. In past a few years, Chinese government has released numerous policies to lead and support the development of domestic solar enterprises, such as "The 14th Five-Year Plan for modern energy system" (2022) and "Top-runner project" (2015). Because of the Top-runner project, the range of domestic high-efficiency modules has been further

expanded, bringing great price competitiveness [2]. Additionally, the development of technology in the industry shows up 2 obvious characteristics: fast update speed and the developing direction towards multi-use scenarios. The future of solar enterprises in China is considerable.

LONGi green energy technology Co. Ltd, one of the leading enterprises in china's solar photovoltaic industry, is regarded as a major industry player in worldwide market. LONGi's innovation ability is very remarkable, standing at the frontier of world technology. The R&D of LONGi's silicon heterojunction photovoltaic cell (HJT) made another breakthrough, and the photoelectric conversion efficiency of M6 full-size battery reached 26.50%, creating a new world record in June, 2022. Since LONGi is a typical solar enterprise, this paper will use LONGi as the study case to assess its value, through which to evaluate the investment value of Chinese solar photovoltaic industry. Also, it is beneficial for external investors to make correct judgment on its enterprise value.

2 Literature Review

For the question that does it worth to invest solar enterprises during COVID-19 epidemic, R. Wei, X. Chen and C. P. Chang (2021) studies the relationship between the worldwide epidemic and the stock prices of solar enterprise and find out that the pandemic significantly influence the stock prices of solar enterprises with its casualties and measures taken by governments; casualties and government response stringency significantly negatively affect solar stock prices in OECD countries. They made a conclusion that it may be irrational to invest in solar enterprises during the outbreak or subsequent waves of a pandemic [3]. However, it is not clear with China, which is a NON-OECD country.

As for NON-OECD countries, QJ Wang, D Chen, CP Chang (2021) concludes that the influence of the COVID-19 pandemic on the demand for solar energy is weaker in NON-OECD countries, leading to the deduction that there exists no significant relationship between the COVID-19 pandemic and the stock prices of solar enterprises [4]. Anyway, it is worth to investigate that how value of solar enterprises in China react to the epidemic and if it is a good choice for investors to invest in solar enterprises.

In the valuation of SUNGROW, a another Chinese solar enterprise, Xie Shiqi (2022) claims that when evaluating the value of new energy enterprises, evaluators should consider classifying the revenue by industry or product to improve the accuracy of the data forecast. In addition, she advises that the evaluator should consider the dual influence of financial and non-financial factors in combination with the enterprise's operating conditions and market environment [5].

For the consideration that which assessment method is suitable for Chinese solar photovoltaic enterprises, Xu Xiang, Wang Laifeng, Huang Xiaomei, Guan Boyuan and Ben Rui (2021) claim that Discounted Cash Flow (DCF) model, is a relatively accurate method. Because solar photovoltaic enterprises are greatly affected by na-

tional economic policies, and they are capital-intensive enterprises with high investment and high debt [6].

3 Methodology

To evaluate the value of LONGi green energy technology Co. Ltd, this paper used DCF model (Discounted Cash Flow model) as the main tool. DCF model is a widely used valuation method followed by the internal rate of return (IRR) and the payback period methods [7]. The discounted calculation of free cash flow reflects the essence of a company's intrinsic value and is the most important and reasonable valuation method. For investors, no matter which valuation criteria will be used to price the stock, a DCF model will help to form a quantitative grasp of the long-term development of the invested company.

DCF model is suitable for: companies with unstable dividends but relatively stable cash flow growth and those whose cash flow is a good indicator of corporate profitability. From the perspective of basic calculation process, DCF model is more complex than relative valuation method, mainly because many parameters need to be set by evaluators themselves, and the rationality of parameters should be considered during setting.

2-stage DCF model is a widely used one. The model divides time into two phases.

The main formula used in this paper is as follows:

$$\sum_{t=1}^n \frac{FCFF_t}{(1+WACC)^t} + \frac{FCFF_t \times (1+G_n)}{(1+WACC)^n \times (WACC - G_n)} \quad (1)$$

t: time of year

WACC: Weighted average cost of capital (the discounted rate)

G: growth rate

FCFF: Free cash flow for the firm

The two-stage DCF model adds the present value of the FCFF in the first high-growth phase and the second stable growth phase to obtain the value of the company.

When using DCF model, this paper projected out free cash flows of LONGi green energy technology Co. Ltd for next 5 years. And there are two ways to evaluate the terminal value beyond last year: Terminal Growth Multiple and Perpetuity Method. The latter one was chosen. After getting the free cash flows, apply weighted average cost of capital (WACC) to get the evaluation of LONGi's enterprise value, which is needed as the discounted rate when computing the present value of free cash flows. In other words, WACC is used to get cash flows back to year 0 (present), getting to the value of the enterprise (EV).

Besides, the price of silicon grows up recently and is predicted by many institutions that the price will keep going up for a time and will not fall down in short-term, which should be considered into forecasts. In fact, the development of China's photovoltaic industry is based on the development and production of crystalline silicon solar cells [8]. Manufacturing in China's photovoltaic industry continued to grow,

with year-on-year growth in output of silicon materials, silicon wafers, battery chips and modules [9]. Therefore, it is needed to consider the influence of the price of silicon when modelling the future operation items, since silicon plays a crucial role in Chinese photovoltaic industry.

From the above, using DCF model is intended to find out the enterprise value academically, with the goal of drawing a reasonable conclusion.

4 Application of DCF model in valuation of LONGi

Since 2-stage DCF model is used, it is needed to set the periods: the first stage is from 2022 to 2026, while the second stage starts from 2027 to unlimited long-term for the end of the value evaluation period.

4.1 Calculation of Cost of Capital

The weighted average cost of capital (WACC) is a method of calculating a company's cost of capital according to the weighted average of all types of capital in total capital sources, which is calculated as follows:

$$WACC = \left[r_{debt} \times (1 - r_{tax}) \times \frac{Debt}{Debt + Equity} \right] + \left[r_{equity} \times \frac{Equity}{Debt + Equity} \right] \quad (2)$$

Debt= value of Debt (Short-term borrowing + long-term borrowing)

Equity= value of Equity (Share price * total share capital)

r_{debt} = cost of debt

r_{tax} = tax rate

r_{equity} = cost of equity

For cost of debt, this paper uses the average of long-term interest rate on loans and short-term interest rate on loans to multiply (1-Tax Rate) to get the r_{debt} . For cost of equity capital, this paper uses capital asset pricing model (CAPM):

$$r_{equity} = r_f + \beta(r_M - r_f) \quad (3)$$

r_f = risk-free interest rate (Ten-year Chinese Government bond yields in July 2022)

r_M = market rate of return (Ten-year average return rate of Shanghai stock Exchange)

β = provided by Wind

Calculate the cost of equity capital: $r_{equity} = 2.858\% + 0.969 * (10.7\% - 2.858\%) = 10.46\%$

As for the D/E ratio, this paper assumes that the D/E ratio would keep constantly with small fluctuation. Based on it, the WACC used here is stable, which means there is only one WACC for the whole process.

According to the formula, $WACC = 10.38\%$, which would be used in next step when computing the present value based on 2-stage DCF model.

4.2 Forecasts of Operation

For revenues, forecast the income varying from different main products based on the historical growth rate of each one. So project out the growth rate in first stage is the first step. Then mainly use the “this year=last year*(1+Growth Rate in prediction)” to obtain the revenues from different sources of income. Out of the consideration about the price of silicon, when estimating the growth rate of “Solar modules and batteries” and “Silicon wafers and silicon rods” which are related to silicon's price strongly, combine the prediction of silicon's price.

For expenses, it is easily to be found that the relationship between LONGi's expenses and LONGi's revenues is close after testing some groups of historical data. Following that rule, this paper use “% of revenue” to find out the historical rate and to model the future rate, by which projecting out the expenses in first stage.

Since then, the net cash flow from operations in each year can be gotten. By computing, the growth rate of net cash flow from operation yearly can also be gotten, as shown in Table 1.

Table 1. The forecast of net cash flow from operations (Unit: Billion RMB)

Revenues	2021A	2022E	2023E	2024E	2025E	2026E
Net Cash Flow from Operation	12322.61	14181.09	16467.37	19639.42	21972.53	25175.26
growth rate of Net cash flow		0.15	0.16	0.19	0.12	0.15

The growth rates of net cash flow from operations yearly is around 15%. Based on the prediction of China's GDP and the potential of the photovoltaic industry, this paper assumes that the growth rate of second stage is 6%. It turns out the net cash flow from operation in 2027E is 26,685.78 billion yuan. All these growth rates would be used in predicting the free cash flow which is based on net cash flow from operations.

4.3 Forecasts of Future Free Cash Flow

After obtaining the growth rates, forecast the free cash flow.

When predicting free cash flow, this paper uses formula (4) below.

$$\text{Free cash Flow} = \text{Net cash from operations} \quad (4)$$

- Depreciation of fixed assets
- Amortization of intangible assets and long-term deferred expenses
- Loss on disposal of long-term assets

From 2022 to 2026, each item in last year multiples (1+the growth rate (eg. 2022E's is 15%)) to get the data in next year except for "Free cash flow", which is computed out based on the equation mentioned before. As for 2027, each item in 2026 multiple the (1+the growth rate (6%)) to get the data.

Table 2. The forecast of free cash flow (Unit: Billion RMB)

Year	Net cash from operations	Depreciation of fixed assets	Amortization of intangible assets and long-term deferred expenses	Loss on disposal of long-term assets	Free cash flow
2022E	14.181	3.179	0.502	0.031	10.470
2023E	16.467	3.691	0.583	0.036	12.158
2024E	19.639	4.402	0.695	0.043	14.500
2025E	21.973	4.925	0.777	0.048	16.222
2026E	25.175	5.643	0.891	0.055	18.587
2027E	26.686	5.981	0.944	0.058	19.702

4.4 Compute the Present Value of FCFE

Following 2-stage DCF model, estimate the present value of different period based on the forecasts of free cash flow (Table 2), growth rate and discounted rate (WACC) we calculated before.

(1) For the first stage (from 2022 to 2026), take the 2022E as an example:

The present value (Table 3) = FCFE in 2022E / (1 + WACC)^t

$$= 10.470 / (1 + 10.38\%)^1 = 9.485 \quad (5)$$

(2) For the second stage (2027~):

The present value of the final worth = FCFE in 2026E * (1 + Growth Rate in Second Stage) / [(WACC - Growth Rate in Second Stage) * (1 + WACC)^t]

$$= 19.702 / [(10.38\% - 6\%) * (1 + 10.38\%)^5] = 274.314 \quad (6)$$

Table 3. The present value of different periods (Unit: Billion RMB)

First Stage	2022E	2023E	2024E	2025E	2026E	2027E~
FCFE	10.470	12.158	14.500	16.222	18.587	19.702
Present Value	9.485	9.978	10.781	10.927	11.342	274.314

(3) Estimation of LONGi's Enterprise Value

LONGi's enterprise value = 9.485 + 9.978 + 10.781 + 10.927 + 11.342 + 274.314 = 326.827 billion yuan

LONGi value per share = Enterprise Value / Total Share Capital = 326.827 billion yuan / 7.582 billion shares = 43.11 yuan per share

5 Conclusion

According to DCF model, the valuation of LONGi's enterprise value is 321.169 billion yuan, and the value per share is 43.11 yuan while the market price per share of LONGi is 62.18 yuan. So it could be believed that the market value is overvalued to some extent. From the reflection of the market we can find that: LONGi's prospect looks good in investors' view even during epidemic. Anyway, based on the outcomes of the paper, it is not a good time for conservative investors to invest LONGi at current period.

There are also some limitations in this paper: firstly, at present, the prediction of cash flow in the valuation is based on the historical cash flow, and it is hard to overcome that the appraisers may not be able to accurately judge the future cash flow according to the historical data. Secondly, the determination of discount rate requires higher efficiency of capital market, but China is still in a weak efficient market, and the discount rate will be affected to some extent at the present stage [10]. In fact, from solar PV to onshore wind to offshore wind power, all these show a consistent increasing trend in weighted average cost of capital [11]. However, this paper only uses single WACC. So there may exist some difference from the reality in the future.

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