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Yangtze River Power Company from the Perspective of DCF

Hao Yu[1,a,*]

[1]*School of Economics and Finance, Tianjin University of Finance and Economics, Tianjin, 300202, China*
a. 2021111728yuhao@stu.tjufe.edu.cn
**corresponding author*

Abstract: Since the birth of Open AI, the Magnificent 7 (M7) represented by Nvidia has gradually become the focus of the world, especially in 2023, the M7 portfolio with an annual return of 53%, almost all of the S&P500 index's annual gains. There are new highs after new highs, and the outstanding performance of the M7 has undoubtedly greatly stimulated the nerves of domestic investors. As a result, in China, scholars have developed a Chinese version of M7: YYDS (In China, YYDS is often described as a big deal) against U.S. stocks, that is, seven stocks that can still reach new highs in the market environment in the past few years. The four letters YYDS stand for different meanings, YY means yinhang (Chinese for bank) and yunyingshang (Chinese for operator), D means dianli (Chinese for electricity) and S means shiyoumei. The two giants of hydropower, Yangtze Power and Huaneng Hydropower, are impressively listed. This paper mainly focuses on the DCF(discounted cash flow) valuation of the current leading enterprise in the hydropower industry, Yangtze River Hydropower Company, and analyzes the hydropower industry itself, emphasizing the prerequisites for using the DCF valuation model, and comparing the stock price obtained by the final DCF valuation with the current price, indicating that there are still certain hidden dangers in the development of the hydropower industry in the future.

Keywords: DCF, Hydropower, Yangtze River Power Company

1. Introduction

Hydropower is an important clean renewable energy, which plays an important role in improving the energy structure, ensuring energy security, reducing greenhouse gas emissions, protecting the ecological environment, and promoting high-quality economic and social development. In recent years, China's renewable energy and hydropower have achieved remarkable results. As of the first half of 2023, the installed capacity of renewable energy in China has reached 1.322 billion kilowatts, historically exceeding coal power, accounting for about 48.8% of China's total installed capacity, of which 418 million kilowatts of hydropower has been installed. In the first half of 2023, the country added 5.36 million kilowatts of hydropower grid-connected capacity, including 2.06 million kilowatts of conventional hydropower and 3.3 million kilowatts of pumped storage capacity [1].

Hydroelectric power, compared with thermal power generation, has the characteristics of clean and environmentally friendly. Although due to the geographical environment and other factors, it does not occupy a good position in China's energy system today, between its own price, peak regulation, and other advantages, in the past ten years of development, it has shown an obvious

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defensive situation, in many years of economic downturn, the hydropower index still maintains a relatively good trend. The two most obvious companies are Huaneng Hydropower Company and Yangtze River Power Company, two leading enterprises. This paper will analyze the hydropower industry itself, emphasizing the prerequisites for using the DCF valuation model and comparing the stock price obtained by the final DCF valuation with the current price.

This paper hopes to use the valuation model to analyze the current economic situation of leading enterprises by taking Changjiang Electric Power Company as an example, hoping to have some reference significance for pan-economic theories such as the fluctuations of enterprises in economic cycles after many years.

2. Differences and Characteristics of Hydropower and Other Energy Developments

2.1. Hydroelectric Power

Hydroelectric power generation is the study of science and technology that studies technical and economic issues such as engineering construction and production and operation of the conversion of water energy into electrical energy.

Hydro is an inexhaustible, inexhaustible, renewable, and free source of clean energy. It uses only the energy given by nature, does not consume water, and does not produce pollution. The proportion of fixed costs in the total investment is relatively high, but the operating costs are low, the sales customers are determined, the payment is timely, and the profit is stable.

On the one hand, hydropower generation is stable, and compared with natural resources such as sunlight and wind, the runoff of rivers is uniform and stable, and has seasonal characteristics. There is no frequent influence such as rain, strong wind, and no wind. The flood season is just at the peak of electricity consumption, so that the power generation of the power station is also output linearly. Hydro energy, on the other hand, is storable. Because electricity is an instantaneous consumer product. The generation, transmission, sale, and use of electricity are formed in an instant. So far, there are no good large batteries available. Hydropower stations can be used through a suitable geographical location to form a reservoir capacity. Make it the best quality grid power supply [2].

Long operation cycle, no development life limit Unlike the well-known BOT projects such as highways and sewage treatment plants, which are limited to 30 years at most, there is no time limit for the development of hydropower resources in China (usually designed according to the life of 50-100 years). As depreciation (usually calculated over 25-33 years) is amortized year by year, all electricity revenue will be maximized as profit. At the same time, as long as the holding cost is controllable, it provides investors who hold for a long time (more than 50 years) with sufficient investment returns and huge cash flow benefits before the emergence of disruptive new energy technologies [3].

Hydropower is a renewable energy source with less impact on the environment. In addition to providing cheap electricity, it has the following advantages: flood control, irrigation water, improved river navigation, and the project also improves transportation, electricity supply and economy in the area, especially for tourism and aquaculture.

2.2. The Characteristics of Changjiang Electric Power Company in Hydropower Industry

2.2.1. Historical Review

Historically, the hydropower sector has seen significant excess returns during the downturn of China's economy in 2008, the decline of the Shanghai Composite Index from the first half of 2011 to the first half of 2014, and the decline of the Shanghai Composite Index from December 2021 to April 2022. The commissioning of new hydropower units on the Yalong River led to an increase in the share price

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of SDIC/Sichuan Investment, bringing significant excess returns. Huaneng Hydropower's relative earnings fluctuate with EPS(Earnings Per Share).

During China's economic downturn in 2008, the excess income from hydropower reached 29%. In 2008, China's economy entered a downward phase, with GDP(Gross Domestic Product) growth and CPI(Consumer Price Index) growth falling sharply in 2008, GDP growth from 12% in 2008Q1 to 7% in 2008Q4, and CPI falling from 7% in January 2008 to 1% in December 2008. For the whole of 2008, the return of the CITIC(China International Trust and Investment Corporation) Hydropower Index was -37%, while the return of the Shanghai Composite Index was -66%, and the excess return of hydropower was 29%.

From the first half of 2011 to the first half of 2014, the Shanghai Composite Index fell in the market, and the hydropower sector had outstanding anti-decline attributes, with an excess return of 10%. From May 2011 to June 2014, the Shanghai Composite Index fluctuated at a low level after a downward trend, with the yield of the CITIC Hydropower Index at -20%, the yield of the Shanghai Composite Index at -30% and the excess return on hydropower at 10% during the same period. From May 2011 to July 2012, the excess income of hydropower was negative, mainly due to the dry water supply since May 2011 (from the data of the flow of the Three Gorges to the end of October, it was particularly dry). According to the National Energy Administration, in 2011, the cumulative average utilization hours of hydropower equipment in China fell sharply by 376 hours to 3,028 hours year-on-year, and the Yangtze River Power's announcement on the completion of power generation in the first three quarters of 2011 showed that as of September 30, 2011, the water from the upper reaches of the Yangtze River had decreased by 25% over the multi-year average.

From December 2021 to April 2022, the Shanghai Composite Index fell under the repeated epidemics, and the water supply was abundant, and the hydropower sector achieved an excess return of 32%. Since December 2021, the epidemic has been repeated and broken out in many places, especially the epidemic in Shanghai in March 2022, and the lockdown in early April affected the normal operation of the trade chain, and the upstream and downstream of the manufacturing industry have been affected to a certain extent, and the Shanghai Composite Index has fallen sharply, with the Shanghai Composite Index yielding -19% from December 2021 to April 2022. In March/April 2022, the abundant water supply prompted the national hydropower generation to increase by 19.8%/17.4% year-on-year, and the anti-decline attribute of the hydropower sector was further amplified, with the CITIC Hydropower Index achieving an excess return of 32% from December 2021 to April 2022.

2.2.2. Two Unique Dimensions

(1) Bond-proxy

The high capax period of hydropower has passed, and hydropower companies in the mature stage are more willing to pay dividends. At present, most of China's hydropower listed companies have completed the development of hydropower stations in the divided river basins, and large-scale expenditures have shown a downward trend, and the completion of China's hydropower infrastructure investment has dropped from 124.6 billion yuan in 2013 to 67.4 billion yuan in 2018, and after the period of high capital expenditure, enterprises are more willing to share the company's operating results and increase the dividend ratio, and the overall dividend ratio of hydropower has increased from 45% in 2013 to 64% in 2017. (Note: The average dividend ratio of hydropower is based on the total dividends of Yangtze River Power/ Huaneng Hydropower/SDIC(State Development and Investment Corporation) Power/ Guiguan Power/ Qianyuan Power/ Mindong Power divided by the total net profit attributable to the parent company) [4].

For Yangtze Power Company, Yangtze Power clearly pays high dividends. According to the latest articles of association, the company has clarified the future high dividend policy, and will pay cash

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dividends of not less than RMB 0.65 per share for the annual profit distribution from 2016 to 2020, and no less than 70% of the net profit per share for each year from 2021 to 2025.

At the same time, the function of quasi-bonds is highlighted, comparing the dividend yield of Yangtze Power and the yield of 10-year treasury bonds, since 2012, the company's dividend yield has increased under the name, and the dividend yield has outperformed the yield of 10-year treasury bonds, and in 2016, the company's new dividend plan was introduced, and the dividend yield has continued to exceed the yield of 10-year treasury bonds.

(2)Future growth

With the injection of Wudongde and Baihetan hydropower stations in 2023, the company's installed capacity will grow in steps, and the controllable installed capacity will increase by 57.5% year-on-year. In the first half of 2023, the company completed the merger of Wudongde and Baihetan hydropower stations, bringing 10.2 million kilowatts and 16 million kilowatts of new installed capacity to the company, respectively, for a total of 26.2 million kilowatts. After the completion of the acquisition, the Company holds the assets of the Three Gorges Hydropower Station in the main stream of the Yangtze River, Gezhouba, Xiluodu, Xiangjiaba, Wudongde, Baihetan, etc., and the Company's controllable installed capacity increased by 57.5% year-on-year from 45.595 million kW to 71.795 million kW, of which 71.695 million kW was installed in China, accounting for about 17.3% of the national installed hydropower capacity in 2022, and the annual designed power generation capacity of domestic units increased by 52.8% from 191.7 billion kWh to 293.0 billion kWh [5].

The expansion and capacity expansion is progressing in an orderly manner, and it is planned to increase the installed capacity by 3.9 million kilowatts in 2023. In 2023, the three power stations of Gezhouba, Xiangjiaba and Xiluodu are planned to increase their capacity by 1.66 million kW and 2.24 million kW respectively through capacity adjustment/expansion, for a total increase of 3.9 million kW of installed capacity. 1) The nameplate capacity of the unit is planned to increase the installed capacity by 1.66 million kilowatts. Xiluodu plans to adjust 18 units, with a total increase of 1.26 million kilowatts, and Xiangjiaba plans to adjust 8 units, with a total increase of 400,000 kilowatts. In addition, Gezhouba has completed the adjustment of the capacity of 19 units by the end of 2022, adding 475,000 kilowatts of installed capacity. The capacity transformation can maximize the benefits of the company's hydropower station by enhancing the utilization rate of the unit's passing flow and optimizing the operation efficiency of the unit, and the expansion of the unit does not involve hydraulic construction costs, only requires a small cost, and the investment efficiency is high. 2) The expansion plan will increase the installed capacity by 2.24 million kilowatts. Gezhouba plans to expand 4 units with a total increase of 800,000 kW, and Xiangjiaba plans to expand 3 units with a total increase of 1.44 million kW. The company will increase its installed capacity by a total of 3.9 million kilowatts in 2023 through capacity adjustment and expansion.

3. Valuation Calculations for DCF

3.1. Calculation of CAPM (Capital Asset Pricing Model) and WACC (Weighted Average Cost of Capital)

The Capital Asset Pricing Model (CAPM) was developed by American scholars William Sharpe, John Lintner, Jack Treynor and Jan Mossin et al., developed in 1964 on the basis of portfolio theory and capital market theory, mainly studies the relationship between the expected return rate of assets and risk assets in the securities market, as well as how the equilibrium price is formed, which is the pillar of modern financial market price theory and widely used in investment decision-making and corporate finance.

The weighted average cost of capital is a method to calculate the cost of capital of a company according to the weighted average of the total capital sources accounted for by various types of capital.

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Sources of capital include common stock, preferred stock, bonds and all long-term debt, calculated by multiplying the cost of each capital (after tax) by its percentage of the total capital and then adding it up. Used mostly for corporate capital budgets (see Table 1). The formula is shown below:

$$\text{CAPM: } R_e - R_f = \beta(R_M - R_f);\ \text{WACC} = \frac{R_e \times E + R_D \times D \times (1 - T)}{D + E} \quad (1)$$

$E -$ Market Value of Equity (million yuan)
$D -$ Market Value of Debt (million yuan)
$R_e -$ CAPM
$R_f -$ Risk Free Rate (%)
$R_M -$ Yield to Maturity of Debt (%)
$R_D -$ Pre − tax cost of debt (%)
$\beta -$ Beta of Equity
$T -$ Corporate tax rate (%)

Table 1: Collation of data related to CAPM and WACC formulas

Index	Value	Comments	Index	Value	Comments
Market Value of Equity (million yuan)	575003	Refer to the market value of the company on January 21, 2024, million yuan	Market Value of Debt (million yuan)	269359	Company's interest-bearing liabilities in the third quarter of 2023
Risk Free Rate (%)	2.39%	Refer to five-year Treasury yields	Corporate tax rate (%)	17.40%	According to corporate income tax expense
Yield to Maturity of Debt (%)	7.66%	Refer to the average annual return of social security fund	Pre-tax cost of debt (%)	4.20%	Refer to the latest People's Bank of China five-year loan LPR
Beta of Equity	0.42	Refer to WIND(2024-1-19)	After tax cost of debt (%)	3.50%	CALCULATION
Equity Risk Premium (%)	4.60%	CALCULATION	WACC	4.20%	CALCULATION

3.2. Prediction of FCFF (Free Cash Flows of Firm)

Corporate free cash flow (FCFF) is the free cash flow available to enterprises, and it is also an important income caliber. Based on the relevant concepts of Asset Appraisal Foundation (2019) and

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Asset Appraisal Practice II (2019) prepared by China Asset Appraisal Association (see Table 2). The formula is shown below:

$$\text{FCFF} = \text{EBIT x } (1 - \text{income tax rate}) + \text{depreciation and amortization} - \text{Capital expenditures} - \textit{ch}\text{ange in non} - \text{cas}\textit{h}\text{ working capital}$$

$$\text{TV} = \frac{\text{FCFF}_5 \times (1+\text{g})}{\text{WACC} - \text{g}} \tag{2}$$

Table 2: Collation of data related to FCFF formula

Unit: million yuan	2023E	2024E	2025E	2026E	2027E
EBIT	49,149.0	53,178.0	55,203.0	57,365.0	60,026.0
Adjusted taxes	(12.9)	(14.0)	(14.5)	(15.1)	(15.8)
EBIAT	49,136.1	53,164.0	55,188.5	57,349.9	60,010.2
Plus: Depreciation and amortization	38,041.0	26,180.0	26,535.0	27,261.0	29,999.0
Change in net working capital	23.9	28.9	36.5	38.6	40.7
Acquisition of fixed assets	(18.2)	(24.7)	(24.7)	(24.7)	(24.7)
Acquisition of works in progress	(10.0)	(10.0)	(10.0)	(10.0)	(10.0)
Acquisition of right-of-use assets	(2.4)	(3.2)	(4.3)	(5.4)	(6.6)
Acquisition of intangible assets	(0.4)	(0.5)	(0.7)	(0.9)	(0.9)
Changes in long-term amortized expenses	(10.0)	(13.5)	(18.0)	(22.8)	(27.9)
FCFF	87,160.0	79,321.0	81,702.3	84,585.7	89,979.9
Growth rate (%)	/	-9%	3%	4%	6%

$$\text{PV(FCFF)} = \sum_{i=1}^{5} \frac{\text{FCFF}_i}{(1+\text{WACC})^i} + \frac{\text{TV}}{(1+\text{WACC})^5} \approx 786233 \text{ million yuan} \tag{3}$$

4. Conclusion

At present, the stock price of Yangtze River Power fluctuates at about 23-28 yuan per share, and through this valuation, we can find that the future development of Yangtze River Power Company will still have some potential, and there is still great potential for the development of hydropower industry at the moment of the current development of the new energy industry.

Meanwhile, operators need to improve their awareness of financial risk management, pay attention to the participation of financial personnel in enterprise management, and pay attention to communication to ensure the timely and effective transmission of important financial information and enhance the timeliness of financial decision-making. Overall, Yangtze Power has no obvious financial risks, and in order to continue to maintain such a level, it is necessary to strengthen the internal control of the enterprise, realize the situation of mutual supervision and interaction, and make every link of the operation within the internal control system; Establish a financial risk assessment team to measure financial risk indicators on a regular basis, predict financial risks in combination with changes in policies and markets, and formulate financial risk prevention and response plans in advance, so as to escort the stable development of enterprises. Due to the limitation of space, this paper only analyzes the valuation of a company of Changjiang Electric Power, and does not analyze the valuation of the remaining leading enterprises in the hydropower industry.

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