



# Analysis of Sany Heavy Industry stock value based on FCFF and FCFE model

Chongyan LI <sup>1a</sup>, Xiaoling LU <sup>1b</sup>, Xianke LI <sup>2c\*</sup>

<sup>1</sup> Guangzhou College of Applied Science and Technology, Guangzhou, China

<sup>2</sup> Macao Polytech University, Macau, China

<sup>a</sup>lichongyan123@163.com, <sup>b</sup>m18316061706@163.com, <sup>c\*</sup>lixianke1987@163.com

## Abstract

The evaluation of stock value is conducive to investors' scientific analysis and prediction of stock value, and improves the scientificity of investment decisions. Sany Heavy Industry Co., Ltd. is a leading enterprise in China's construction machinery industry. Evaluating its stock value will help China's construction machinery enterprises implement strategic management and improve the overall competitiveness of the industry. This paper uses free cash flow model (FCFF) and equity free cash flow model (FCFE) to scientifically evaluate the future income of Sany Heavy industry enterprise assets, discount the future income through a certain discount rate to measure the stock value, and compare it with the current stock price to judge whether the company's stock price is undervalued at present.

**Keywords:** Sany Heavy Industry; FCFF valuation method; FCFE valuation method; stock value

## 1. INTRODUCTION

Stock value refers to the value of resources owned or controlled by listed companies to investors. Stock value is an important basis for investors to make investment decisions. The sources of investors' income in the stock market include the dividends paid by the company during the period of holding shares and the capital gains brought by the bid ask spread when selling shares.

## 2. ABSOLUTE VALUATION METHOD OF STOCK VALUE

Absolute valuation method includes free cash flow model (FCFF) and equity free cash flow model (FCFE). Its core lies in scientifically evaluating the future income of enterprise assets, discounting the future income through a certain discount rate to measure the stock value, and comparing it with the current stock price to judge whether the company's stock price is undervalued at present.

When the absolute valuation method is used to evaluate the stock price, the following conditions should be met: first, the enterprise should have the ability of long-term sustainable operation and profitability; Second, the expected future income and risks of the enterprise can be predicted and measured in currency [5]; Third, the

future profit years of the enterprise can be scientifically predicted.

Free cash flow discount model (FCFF), the formula is as follows:

$$PV = \sum_{t=1}^n \frac{FCFF_t}{(1+WACC)^t} + \frac{FCFF_{n+1}}{(WACC-g_n)(1+WACC)^n} \quad (1)$$

Where PV is the company value; T represents the period in which cash flows are received. WACC means weighted average cost of capital;  $g_n$  represents the sustainable growth rate of operating cash; N is the age.

The formula of WACC is as follows:

$$WACC = K_E \frac{V_E}{V_D+V_E} + K_D(1-T_C) \frac{V_D}{V_D+V_E} \quad (2)$$

Where  $K_E$  is the cost of equity;  $K_D$  is the cost of debt;  $T_C$  refers to the corporate income tax rate;  $V_E/(V_D + V_E)$  refers to equity financing proportion;  $V_D/(V_D + V_E)$  refers to debt financing ratio.

The calculation ideas of FCFE and FCFF are the same and will not be repeated.

## 3. WEIGHTED AVERAGE COST OF CAPITAL

Absolute valuation method includes FCFF method and FCFE method. First, the free cash flow in the past five years should be calculated to predict the free cash

flow in the next five years. Secondly, the free cash flow in the next five years should be discounted and compared with the current stock price through the discount coefficient, that is, the weighted average cost of capital. Therefore, the weighted average cost of capital is calculated first, and the discount coefficient is obtained from the weighted average cost of capital as the discount rate.

### 3.1. Cost of debt capital

Sany has not issued listed bonds, but has a large number of interest bearing debts [3]. Its loans are mainly one to three-year loans from financial institutions. Therefore, the benchmark interest rate of one to three-year bank loans published by the people's Bank of China is 4.75% as its pre tax debt capital cost. In addition, because the debt interest has the function of Tax Offset, the cost of debt capital after tax = the cost of debt capital before tax  $\times$  (1- income tax rate). The income tax rate of Sany Heavy Industry is 15%. Therefore, the after tax debt capital cost of Sany Heavy Industry in 2016-2020 is 4.04%.

### 3.2. Cost of equity capital

This paper uses the capital asset pricing model to calculate the cost of equity capital. The formula is as follows:

$$K_e = K_f + \beta \times (K_m - K_f) \quad (3)$$

Among  $\beta$  Is the risk coefficient. The specific calculation method is to export the monthly closing price of Sany Heavy Industry and construction machinery industry from december2015 to december2020 in flush software with one month as the return period.

Monthly yield = (closing price of the current month - closing price of the previous month) / closing price of the previous month. The monthly rate of return of Sany Heavy Industry is K1 and that of construction machinery industry is K2. From the correlation analysis of K1 and K2  $\beta$  Value.

**Table 1:** Risk coefficient  $\beta$ .

Year	2016	2017	2018	2019	2020
$\beta$	0.78	0.33	0.17	0.97	0.61

In the capital asset pricing model,  $K_m$  is the market rate of return, expressed by the market rate of return of the industry.  $K_f$  is the risk-free rate of return, which generally refers to the return on investment in treasury bonds, government bonds and bank deposits. Expressed in the interest rate of five-year treasury bonds.  $K_m - K_f$  refers to the market risk premium, which refers to the additional income required for risky investment other than risk-free income. See Table 2 for details.

**Table 2:** Cost of equity capital from 2016 to 2020.

Year	2016	2017	2018	2019	2020
$\beta$	0.78	0.33	0.17	0.97	0.61
Risk free return	4.42%	4.32%	4.27%	4.27%	3.97%
Market rate of return	14%	14%	14%	14%	14%
Market risk premium	9.58%	9.68%	9.73%	9.73%	10.03%
Cost of equity capital	11.89%	7.51%	5.92%	13.71%	10.09%

### 3.3. Weighted average cost of capital

The debt capital cost and equity capital cost calculated in the above two sections are the weight proportion [4]. The following is the specific amount of debt capital cost and equity capital cost and total capital of Sany Heavy Industry from 2016 to 2020. The weighted average cost of capital can be obtained by weighted average. See Table 3 for details.

**Table 3:** Debt capital cost, equity capital cost occupation amount and total capital of Sany Heavy Industry from 2016 to 2020 (100 million yuan).

Relevant indicators	Direction	2016	2017	2018	2019	2020
Total liabilities	+	381.0	318.6	412.7	508.2	680.9
Notes payable	-	29.23	47.20	84.05	80.18	73.15
Accounts payable	-	46.05	62.18	87.86	122.8	248.9
Advances received	-	10.63	14.70	13.57	12.81	0.00
Payroll payable	-	3.08	4.89	10.46	12.93	18.64
Taxes payable	-	3.51	5.33	5.24	15.15	20.30

Other payables	-	24.82	23.39	29.61	41.63	62.12
Dividends payable	-	1.15	0.86	0.91	1.01	1.36
Total Current Liabilities	+	238.0	229.8	339.4	479.5	620.7
Deferred Tax Liability	-	2.19	6.46	6.50	7.14	6.00
Deferred income	-	1.27	2.30	2.72	4.02	5.34
Non current liabilities	+	143.0	88.82	73.37	28.66	60.18
Debt capital occupation	—	640.0	469.9	584.5	718.7	925.9
Amount of equity capital occupied	—	227.2	255.0	314.8	471.5	567.2
Total capital	—	867.27	724.91	899.36	1190.20	1493.16

WACC = amount of debt capital occupied / total capital × Debt capital cost ratio + equity capital occupation amount / total capital × Cost ratio of equity capital. The weighted average capital cost of Sany Heavy Industry from 2016 to 2020 can be obtained. See Table 4 for details.

**Table 4:** Weighted average capital cost of Sany Heavy Industry from 2016 to 2020 (100 million yuan).

Relevant indicators	2016	2017	2018	2019	2020
Amount of debt capital occupied	640.07	469.91	584.56	718.70	925.96
Amount of equity	227.2	255.0	314.8	471.5	567.2

capital occupied					
Total capital	867.27	724.91	899.36	1190.20	1493.16
Debt capital cost ratio	4.04%	4.04%	4.04%	4.04%	4.04%
Equity capital cost ratio	11.89%	7.51%	5.92%	13.71%	10.09%
Weighted average cost of capital	6.10%	5.26%	4.70%	7.87%	6.34%

### 3.4. Calculation of free cash flow

Step 1:

free cash flow = net operating profit after tax - increase in working capital - (capital expenditure - depreciation and amortization). Among them, after tax operating net profit = EBIT income tax.

EBIT = operating income - operating costs - business taxes and surcharges - administrative expenses - sales expenses - asset impairment losses.

See Table 5 for the data of after tax net operating profit.

Step 2:

working capital = operating current assets - operating current liabilities.

Among them, operating current assets include accounts receivable, monetary funds, notes receivable, prepayments, inventories, non current assets due within one year, other receivables, etc. Operating current liabilities include payroll payable, notes payable, accounts payable, other accounts payable, etc. See Table 6 for working capital data.

**Table 5:** After tax operating net profit of Sany Heavy Industry from 2016 to 2020 (100 million yuan).

Relevant indicators	Direction	2016	2017	2018	2019	2020
Operating income		232.88	383.44	558.22	756.7	993.4
Operating costs	-	171.88	268.11	387.33	509.3	697.2
Business tax and	-	2.20	2.79	3.26	3.73	4.08

surcharge						
Selling expenses	-	3.59	38.32	44.47	54.88	53.32
Administrative expenses	-	21.21	17.62	20.46	20.67	22.01
Assets impairment loss	-	9.48	11.89	10.95	—	—
EBIT	—	4.52	44.68	91.76	168.12	216.80
Income tax	-	-1.01	6.42	12.47	20.01	26.71
Net operating profit after tax	—	5.53	38.26	79.29	148.11	190.09

**Table 6:** Net increase of working capital of Sany Heavy Industry from 2016 to 2020 (100 million yuan).

Relevant indicators	2016	2017	2018	2019	2020
Operating current assets	373.07	336.86	472.98	552.64	642.46
Operating current liabilities	103.18	137.66	211.98	257.54	402.81
Working capital	269.89	199.21	261.00	295.10	239.65
Increase in working capital	-4.76	-70.69	61.79	34.10	-55.45

**Table 7:** Capital expenditure and depreciation of Sany Heavy Industry from 2016 to 2020 (100 million yuan).

Relevant indicators	2016	2017	2018	2019	2020
Original price of fixed assets	140.1	128.1	118.7	106.2	108.4
Accumulated depreciation of fixed assets	88.17	100.5	112.5	116.6	126.1

Net value of fixed assets	140.1	128.0	118.6	106.1	108.4
Increase in net value of fixed assets	-12.12	-12.09	-9.38	-12.52	2.26
Construction in progress	9.66	8.33	7.91	11.05	37.43
Increase in net value of construction in progress	-0.17	-1.32	-0.42	3.14	26.38
Intangible assets	41.88	40.92	38.80	33.40	32.28
Increase in net value of intangible assets	-2.48	0.96	2.12	5.40	1.12
Amortization of intangible assets	3.94	3.39	3.78	3.55	3.02
Amortization of long-term deferred expenses	0.36	0.16	0.27	0.76	0.54
Depreciation and amortization	—	—	—	0.61	0.57

Finally, from the above two steps, it is deduced that free cash flow = after tax net operating profit - (added value of operating current assets - added value of operating current liabilities) - (capital expenditure - depreciation and amortization). The free cash flow of Sany Heavy Industry from 2016 to 2020 can be obtained. The specific data are shown in Table 8 below.

**Table 8:** Free cash flow of Sany Heavy Industry from 2016 to 2020 (100 million yuan).

Relevant indicators	Direction	2016	2017	2018	2019	2020
Net operating	—	5.53	38.2	79.2	148.1	190.0

profit after tax						
Net increase in working capital	-	-4.76	-70.7	61.7	34.10	-55.45
Increase in net value of fixed assets	-	12.1	12.1	9.38	12.52	2.26
Increase in net value of construction in progress	-	0.17	1.32	0.42	3.14	26.38
Increase in net value of intangible assets	-	2.48	0.96	2.12	-5.40	-1.12
Depreciation and amortization	+	—	—	—	0.61	0.57
Free cash flow	—	25.06	123.32	29.4	129.3	218.5

## 4. VALUATION CALCULATION

### 4.1. Forecast of operating income

To use the absolute valuation method to predict the enterprise value, the enterprise should have the ability of long-term sustainable operation and profitability [2]. According to the above analysis, Sany Heavy Industry is in good operating condition at present. Except for poor solvency, most benign indicators are higher than the industry average. Therefore, it is considered that its operating and development status will be higher than the average level of the construction machinery industry in 2021-2025.

Therefore, the average growth rate of operating income of construction machinery industry in recent five years is taken as the average growth rate of operating income of Sany in the next five years. The formula is: Sany's operating revenue in the next five years = its average operating revenue in the recent five years  $\times$  (1+ its average growth rate of operating income in the coming years). The calculation results are shown in Table 9 and table 10.

**Table 9:** Average growth rate of operating income of construction machinery industry from 2016 to 2020.

Year	2016	2017	2018	2019	2020
Growth rate	4.11%	34.56%	35.58%	24.83%	29.31%

Average growth rate of the industry predicted by China Construction Machinery Industry Association According to 25.68%, the average operating income of Sany Heavy Industry in recent five years is 58.490 billion yuan.

**Table 10:** Predicted operating income of Sany Heavy Industry from 2021 to 2025 (100 million yuan).

Year	2021	2022	2023	2024	2025
Operating income	735.10	923.88	1161.13	1459.31	1161.13

### 4.2. Valuation calculation of FCFF model

FCFF method is to obtain the present value of enterprise value by discounting the future free cash flow, including two stages: high-speed growth period and sustainable growth period. The calculation process is as follows. [1]

The free cash flow from 2021 to 2025 can be predicted. So the first step is prediction. Make correlation analysis between operating income and each subject. When R is greater than 0.8, it is judged to be relevant, that is, the account will change with the change of operating income in the future years. By multiplying the operating income from 2021 to 2025 calculated above by the proportion, the predicted value of the items related to operating income in 2021 to 2025 can be obtained. On the contrary, it is judged to be irrelevant. The irrelevant treatment method is to assume that the value of the subject remains unchanged from 2021 to 2025, and the value is the average value from 2016 to 2020.

Step 2: calculate the free cash flow of the future year from the forecast value of each subject. The process is consistent with the calculation process of free cash flow in 5.3.1 and will not be repeated.

The formula is: free cash flow = net operating profit after tax - (added value of operating current assets - added value of operating current liabilities) - (capital expenditure - depreciation and amortization). The free cash flow of Sany Heavy Industry from 2021 to 2025 can be predicted.

Finally, the formula is as follows: the present value of Sany free cash flow from 2021 to 2025 = free cash flow from 2021 to 2025  $\times$  Discount factor. Take the arithmetic mean of Sany's weighted average capital cost from 2016 to 2020, i.e. 6.05%, as the discount rate. Obtain the discount coefficient of its free cash flow from 2021 to 2025. Thus, the present value of free cash flow of Sany Heavy Industry in the high-speed growth period from 2021 to 2025 is estimated. The discount factor formula is: discount factor =  $(1+6.05\%)^{-t}$ . T is the term. The present value formula of free cash flow is as follows:

$$PV = \sum_{t=1}^n \frac{FCFF_t}{(1+WACC)^t} + \frac{FCFF_{n+1}}{(WACC-g_n)(1+WACC)^n} \quad (4)$$

Where PV is the company value; T represents the period in which cash flows are received. WACC means weighted average cost of capital;  $g_n$  represents the sustainable growth rate of operating cash. The first half of the formula calculates the present value of free cash flow in the high-speed growth period, and the second half calculates the present value of free cash flow in the sustainable growth period. The denominator is the discount coefficient of the discount rate, which takes the arithmetic mean of the weighted average capital cost from 2016 to 2020, i.e. 6.05%.

**Table 11:** Present value of free cash flow during high growth period of Sany Heavy Industry (100 million yuan).

Year	2021	2022	2023	2024	2025
Free cash flow	140.67	68.52	92.95	123.66	460.36
Discount factor	0.94	0.89	0.84	0.79	0.75
Present value of free cash flow	132.64	60.92	77.93	97.75	343.13

Because there is no enterprise whose performance can maintain rapid growth. Therefore, in the assessment of the present value of free cash flow of Sany in the sustainable growth period after 2025, the sustainable growth rate is very important. The prediction of the sustainable growth rate means that the enterprise is in a stable state. Its sales growth rate is getting closer to China's GDP growth rate over time. Therefore, it is conservatively estimated that the sustainable growth rate of Sany Heavy Industry in the next five years will be 5.2%.

**Table 12:** Present value of free cash flow during the sustainable growth period of Sany Heavy Industry.

Free cash flow in 2025	343.13
Discount factor	0.75
Sustainable growth rate	5.2%
Present value of free cash flow	655.46

Therefore, the enterprise value of Sany Heavy Industry under the FCFF method = the sum of the present value of free cash flow in the high-speed growth period + the present value of free cash flow in the sustainable growth period = 136.782 billion yuan. By the end of 2020, the share capital of Sany Heavy Industry was 8.493 billion shares. And equity value = enterprise value - net debt value. Among them, the net debt value = financial

liabilities - financial assets, and the data of both are zero in the annual reports of Sany Heavy Industry from 2016 to 2020. That is, the net debt value of Sany Heavy Industry is zero.

Therefore, the value per share of Sany Heavy Industry under FCFF method = 1367.82/84.93 = 16.11 yuan.

### 4.3. Valuation calculation of FCFE model

The FCFE valuation method is the same as the FCFF method and will not be repeated. The difference is that FCFE valuation method is to calculate the cash flow of equity, discount it and compare it with the existing value. And Equity Cash Flow = after tax net operating profit - net investment in equity this year.

Since FCFE method is to calculate equity cash flow, the weighted average capital cost can no longer be used as the discount rate, but the equity capital cost of Sany Heavy Industry from 2016 to 2020, taking the arithmetic mean of 9.82% as the discount rate.

The enterprise value of Sany Heavy Industry under the FCFE method = the sum of the present value of Equity Cash Flow in the high-speed growth period + the present value of Equity Cash Flow in the sustainable growth period = 100.938 billion yuan. So the value per share = 1009.38/84.93 = 11.88 yuan.

## 5. CONCLUSION

The research conclusion on the stock value of Sany Heavy Industry in this paper is: Sany Heavy Industry operates well, but it is negatively affected by the strong periodicity of the construction machinery industry, the COVID-19 and the slowing down of the development of the real estate industry at the end of 2021. In the past five years, the share price of Sany Heavy Industry has been undervalued and fell. According to the FCFF model and FCFE model, the current intrinsic value per share of Sany Heavy Industry is RMB 11.31-16.11.

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## REFERENCES

- [1] Chen Shijin, Luo Xiangming Analysis on the current situation and economic effect of China's insurance industry opening to the outside world [J] Journal of insurance vocational college, 2021,35 (01): 34-42.

- [2] Huang Zhiliang, Nie Ruifang, Zheng Jianhong Reflection on A-share value investment in the era of registration system [J] Contemporary economy, 2021 (10): 24-28.
- [3] Li Wenying, Ma Guangqi Application of discounted free cash flow model in enterprise value valuation - Taking Sany Heavy Industry as an example [J] Accounting communication, 2014 (11): 40-41.
- [4] Yu Ping, Li Jing Research on market value investment strategy of valuation indicators and fundamental indicators [J] Accounting communication, 2021 (09): 102-106.
- [5] Zhou Yanli, Wei Chenyang, Yang Xiuwu. Observation and Analysis on the current situation of digital transformation of insurance industry [J] Tsinghua financial review, 2021, (06): 85-88.

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