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Value Evaluation of Service Enterprises in the Energy Sector: A Case Study of CPEC

Yunfan Zhang

School of Economics and Management, Northwest University, Xi'an, China
zhangyunfan2004@gmail.com

Abstract. This article first summarizes the traditional methods of enterprise value evaluation and references literature on enterprise value evaluation methods used in other industries. Next, the article discusses the relevant theories and methods of traditional value assessment, such as the cost method and market comparison method, and explains the reasons why they are not applicable in this case. Next, starting from the macro perspectives of the energy industry and engineering field, and based on the limitations of traditional valuation methods applied to enterprise valuation, constructing free cash flow attempts to accurately value China Petroleum Engineering Co., Ltd (CPEC). Subsequently, the valuation model constructed above was used to value the case company, and it was found that the error with the true market value was within an acceptable range, verifying the effectiveness of the model. Finally, the SWOT model was used to analyze and study the industry competition pattern, industry growth potential, and industry risks. The conclusion was drawn that the industry is highly competitive, has limited growth potential, and high industry risks, and corresponding suggestions were proposed.

Keywords: Enterprise value evaluation, CPEC, Revised DCF model.

1. Introduction

Since the late 1990s, when China's petrochemical industry initiated strategic restructuring, especially with the successive listing of the two major groups, PetroChina and Sinopec, and their holding companies in overseas and domestic A-share and H- share markets, domestic oil and gas enterprises have increasingly received attention from domestic and foreign capital markets. After the establishment of the "mixed ownership economy" reform direction for the first time in China in 2013, companies under Sinopec and PetroChina successfully explored mixed ownership reform. In this context, the subsidiaries of the two major groups have launched a new wave of asset integration and mergers and acquisitions, attracting various financial institutions, including equity investment institutions, banks, and securities companies, as well as other industrial capital to actively participate. The efficient promotion of these investments and financing behaviors requires the establishment of a precise valuation system as the basis. In the practice of the energy sector, more attention is often focused on the value of major oil and gas fields under China National Petroleum Corporation (CNPC) and overseas first-party enterprises under China National Petroleum Corporation, while oil auxiliary enterprises such as China Petroleum Engineering Corporation

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(CPEC) are often overlooked. If there is a lack of reasonable understanding of the value of these enterprises, it will hurt the growth, restructuring, and development of the enterprises themselves.

Yan Wei and Liu Xiyou used the Discounted Cash Flow (DCF) method to construct production decision models with the goals of minimizing the present value of producer costs and maximizing the present value of profits, respectively [1]. The profit present value maximization model comprehensively considers multiple factors such as benefits, costs, and risks in the process of product production and sales, making it more realistic. Huang Guojian and Ren Guizhen proposed a DCF valuation framework that integrates business data to address the issue of insufficient adaptability of traditional valuation methods for high Research and Development (R&D) investment technology enterprises [2]. Based on data from listed companies, a dynamic cash flow prediction model was constructed, and user growth indicators were introduced to optimize financial forecasting. Combined with the Weighted Average Cost of Capital (WACC) capital cost measurement system, accurate discounting of free cash flow was achieved. Gao Zhenying and Xu Wen pointed out that in the Western valuation logic, Chinese assets, especially state-owned assets, are usually undervalued. Based on the analysis of the valuation characteristics, problems, and causes of the A-share market, they constructed a valuation system with Chinese characteristics and explored its practical application effects [3]. The research results of May Abdulaziz Alamoudi indicate that social performance has a positive driving effect on corporate value, emphasizing the role of social responsibility in driving financial performance. In addition, companies can effectively utilize social initiatives to increase market valuation, which provides new insights for the valuation section of this article [4].

2. Overview of value evaluation theory

2.1. Rationality of valuation methods

Currently, the commonly used international enterprise valuation paths mainly include three categories: income approach, cost approach, and market approach, each with specific application scenarios and limitations. The cost method is generally applicable to enterprises where costs are easy to trace and measure, tangible assets dominate, and the fair value of assets is clear. The market approach is more suitable for those who have already been listed, have high market liquidity, and have many comparable trading cases. As a typical technology-intensive entity, energy group service-oriented enterprises such as CPEC have characteristics such as one-time, complexity, and long-term business, and their cost composition is complex and difficult to accurately calculate, so the cost method is not applicable [5]. At the same time, due to the fact that other engineering construction enterprises under China National Petroleum Corporation can be regarded as its affiliated companies, the lack of sufficient comparable enterprise samples also limits the use of the market approach. Relatively speaking, the income approach can estimate the overall asset value more reasonably by predicting the future earnings of the enterprise and discounting them to present value, making it more suitable for the valuation scenario of CPEC.

2.2. Theoretical basis of income-based valuation

The income approach, as one of the core paths for enterprise value evaluation, is based on the basic logic of capitalizing or discounting the potential future income of the evaluated object. This method is based on the discount theory in economics, and its evaluation focus is not on the static composition of enterprise assets, but on the potential for future value creation of assets. This

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approach is like depositing funds in a bank to earn interest, essentially a current measure of future returns. Therefore, the income approach is particularly suitable for evaluating the overall sustainable operating value of a company, an advantage that cost and market approaches cannot match. At the specific model level, the income approach covers various models such as discounted cash flow, discounted dividends, and capital asset pricing. Among them, the discounted cash flow model is less affected by changes in accounting policies and can more objectively reflect the inherent logic of enterprise value and the development direction of business management. The basic formula is as follows:

$$P = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} \tag{1}$$

In the above equation, P represents the estimated value of the enterprise, CF_t represent the cash flow generated by the evaluated enterprise (or asset) at time t, r is the discount rate of expected cash flow, and n represents the life of the evaluated enterprise (or asset). It can be seen from the above equation that enterprise value is essentially the present value of future cash flows of the enterprise, and any asset can be discounted and valued via this model.

3. Design and introduction of the revised model

The DCF discounted cash flow model restores a company's expected cash flows during viable periods to their current value. The historical cash flow of the enterprise under this case over a period of time (5 years are collected in this article) is first analyzed to predict the free cash flow of the enterprise within the next predicted periods. Subsequently, the discounted rate will be calculated comprehensively through the risk-free rate (R_f), risk premium rate (R_m), and coefficient (β). Finally, through the DCF model, the enterprise value will be calculated.

This article takes into account the type of the targeted enterprise and the special nature of having a large number of overseas businesses when calculating historical cash flows, and has made adjustments to some accounting subjects to achieve accuracy in valuation. For financial expenses, the traditional treatment on the income statement is to deduct them as period expenses in the calculation of net profit. But in the valuation of this article, this part of the profit and loss should not be treated as period expenses, but should be added back to the net profit to objectively reflect the value of CPEC. For non-recurring gains and losses, they do not directly affect the company's production, operation, and investment. Therefore, these gains and losses should be deducted from net profit and adjusted accordingly in the calculation of total capital. For various types of reserves, as a petroleum engineering construction company, CPEC is constrained by the contract period and engineering quality guarantee deposit, and has a large amount of corporate debt. The amount of impairment reserves provisioned is relatively large. When the company provisioned various impairment reserves, the impairment did not actually occur, but this provision would cause a decrease in the current profit of the enterprise, which is not conducive to the objective reflection of the company's value. Therefore, this article will add the provision for impairment back to the current period's net profit and total capital.

3.1. Calculating historical free cash flow

The income tax rate is calculated at 25%. According to the consolidated balance sheet, income statement, and cash flow statement in the annual report of CPEC, Table 1 can be obtained [6,7]. The accounting criteria are as follows:

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(1) Cash flow=Profit before interest and tax multiplied by (1-25%) + Depreciation increase + amortization increase - working capital increase -Capital expenditures

(2) EBIT=operating profit + non-operating expenses - non operating income + interest expenses in financial expenses

(3) Depreciation and amortization increase="Fixed asset depreciation", "Intangible asset amortization", "Long term deferred expense amortization", "Adjusting net profit to operating cash flow" and other subjects

(4) Increased working capital = (current period operating current assets - current period operating current liabilities) - (previous period operating current assets – previous period operating current liabilities), excluding financial assets such as cash and trading financial assets, and adjusting the treatment methods of some accounts according to the new accounting standards

(5) Capital expenditures refer to the expenses incurred by a company to purchase various non-current assets (intangible assets, long-term investments, fixed assets, and other non-current assets), minus the increase in interest-free non-current liabilities such as special payables, long-term payables, and other non-current liabilities that do not require interest transfer.

Table 1. Historical calculation of free cash flow of CPEC from 2020 to 2024 (unit: RMB 100 million)

year subject	2020	2021	2022	2023	2024
EBIT	14.077	15.528	14.217	15.588	14.207
Depreciation increase	6.899	5.598	6.347	6.019	6.345
Amortization increase	2.354	4.827	5.366	5.071	4.953
Increased working capital	5.839	-10.648	0.849	-3.009	0.979
Capital expenditures	4.922	4.181	3.361	3.216	5.164
Cash flow	9.049	18.955	18.176	22.573	17.769

According to Table 1, it can be seen that the cash flow of CPEC has shown an overall fluctuating trend from 2020 to 2024, with particularly significant fluctuations in operating costs. Therefore, based on the free cash flow from 2020 to 2024, excluding outliers, the compound annual growth rate (CAGR) is calculated to be -2.17%, and the future cash flow forecast for China Petroleum Engineering Co., Ltd. is made accordingly.

3.2. Predicting free cash flow for the next five years based on CAGR

Table 2. Free cash flow prediction of CPEC from 2025 to 2029 (unit: RMB 100 million)

year	2025	2026	2027	2028	2029
Cash flow	17.3832	17.0054	16.6368	16.2759	15.9228

3.3. Determination and calculation of discount rate

The calculation of discount rate is based on the weighted average cost of capital:

$$WACC = \frac{E}{V} R_e + \frac{D}{V} R_d (1 - T) \quad (2)$$

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Among the above equations, R_e is the equity cost, which is the necessary rate of return for investors; For the cost of debt; E/V is the percentage of equity to total financing and capitalization ratio; D/V is the percentage of debt to total financing amount; T is the corporate income tax rate, which is set at 25% in this article. Meanwhile, this article uses the CAPM model to calculate the equity cost, namely:

$$\mathrm{R_e} = \mathrm{R_f} + \beta(\mathrm{R_m} - \mathrm{R_f}) \tag{3}$$

In practical operation, the yield on government bonds is generally used as a proxy for the risk-free rate of return. With a going concern as the accounting assumption, the yield of 10-year government bonds with the forecast reference period of 2024 is 2.15%. For the risk coefficient, CPEC is a listed company, and its risk coefficient can be found in the information released by Wind and Tonghuashun. Selecting the Shanghai and Shenzhen 300 Index, the average risk return rate on the evaluation benchmark date (September 1, 2024) was found to be 9.1%. At the same time, in the benchmark year, CPEC's debt capital accounted for 2.5% and equity capital accounted for 97.5%. Overall, the WACC index is 10.37%.

3.4. Predicting enterprise value

Based on the predicted cash flows for the next five years in Table 2 and the values of various parameter indicators in chapter 4.3, this article adopts the assumption of perpetual annuity growth. However, the traditional assumption of perpetual annuity growth does not take into account the cyclical nature of energy sector enterprises. Therefore, this article modifies the cash flow method to eliminate the influence of cyclicality. Due to the positive correlation between the cycle of resource-based enterprises and the macroeconomic cycle, this article comprehensively uses the compound growth rate of future Gross Domestic Product (GDP) published by the National Bureau of Statistics to predict the future main business income of enterprises, and determines the growth rate of enterprise perpetual pension based on this. Considering the situation and main business of CPEC's state-owned holding listed company, in order to improve data accuracy, this article selects the contribution rate of the secondary industry to GDP growth from 2020 to 2024 as a substitute, and takes its arithmetic mean as 1.9%. Therefore, this article adopts 1.9% as the perpetual annuity growth rate of China National Petroleum Engineering Corporation Limited [8].

According to the formula for calculating the Terminal Value (TV) of an enterprise:

$$\mathrm{TV} = \mathrm{FCFF}_{2029}\frac{(1+\mathrm{g})}{(\mathrm{WACC}-\mathrm{g})} \tag{4}$$

The final value of the enterprise is 19155380489.37. According to the evaluation benchmark date of Dongfang Wealth Network (September 1, 2024), the market value of China Petroleum Engineering Co., Ltd. is 19.82 billion yuan, and the DCF model predicts a value with an error of 3.336% compared to the market value of China Petroleum Engineering Co., Ltd, which is acceptable as a prediction result.

4. SWOT model analysis

The article adopts the SWOT analysis method to systematically sort out the internal and external conditions for the development of CPEC, and proposes an optimization path, aiming to help it explore effective paths for high-quality development in the energy field at present and in the future.

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4.1. Growth-oriented strategy

Faced with internal advantages and external opportunities, the core of a growth strategy is to focus on the main business, lead the domestic market, and actively explore overseas opportunity markets. The basis for achieving this goal is to broaden the internal and external financing channels of the company to ensure the cash flow needs during the implementation of bulk engineering projects. At present, the net profit margin of CPEC is at a relatively low level, and the company's retained earnings are insufficient, resulting in weak internal fundraising capabilities. However, CPEC has good market prospects and development potential, and with the endorsement of state-owned enterprise credit ratings, debt financing methods can be appropriately introduced. By applying for long-term and short-term loans, or by allocating appropriately sized bank loans. This type of fundraising method has lower costs, standardized channels, and flexible forms, which are in line with the common fundraising practices in the current engineering construction industry. In addition, as the internal project party of the group company, CPEC can carry out factoring business, and can moderately relax the customer payment cycle to promote the smooth signing of project contracts, which can effectively enhance the short-term fundraising ability of the enterprise [9].

4.2. Diversification strategy

In the context of international oil price fluctuations, investment uncertainty, and trade protectionism, the core of implementing a diversification strategy is to extend the industrial chain, optimize market layout, and minimize the risks brought by market competition uncertainty [10]. On the one hand, by utilizing strong project management experience and technical means (such as introducing and using large-scale centralized Enterprise Resource Planning (ERP) systems, establishing financial shared operation centers), while undertaking a large number of traditional energy engineering construction projects in large quantities, and taking advantage of its Engineering, Procurement, and Construction (EPC) engineering general contracting qualifications, large number of affiliated enterprises, and wide geographical distribution, it gradually extends its engineering construction business to the clean energy field. Such projects are less affected by oil price fluctuations, provide relatively stable cash flow, and help enterprises adapt to future market changes promptly. The 180000-ton synthetic ammonia plant, the world's largest single unit green ammonia production facility, constructed by China HuanQiu Contracting & Engineering Co., Ltd., a subsidiary of China National Petroleum Corporation, is a typical successful case. The project innovatively applies the design concept of "green hydrogen consumption of green electricity, green ammonia consumption of green hydrogen, and integration of source, network, load, and storage" throughout the entire industry chain, achieving multiple world records such as the largest one-time production of green synthetic ammonia single unit project and the largest scale of alkaline solution and PEM mixed electrolysis water hydrogen production. At the same time, the direct production of this project has solved 12 major technological bottlenecks in the coupling of new energy and chemical engineering. This achievement has also been widely reported by official mainstream media and has greatly increased the company's recognition in the field of new energy construction.

4.3. Reversing strategy and defensive strategy

CPEC has weak control over cost and expenses, with operating costs occupying a significant amount of free cash flow, which in turn affects the company's ultimate profitability. This is currently the major weakness that limits CPEC's ability to reduce costs and increase efficiency. In terms of R&D

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investment, the R&D expenses of CPEC have been continuously increasing in recent years, with a significant growth rate, but there is still a significant gap compared to competitors in the industry. The overall investment scale of CPEC is relatively large, but the asset structure is mainly based on fixed assets, and the turnover efficiency of fixed assets has always been low. The investment in non-fixed asset categories, such as intangible assets and construction in progress, is relatively limited. In addition, in terms of long-term equity investment and other equity instrument investment, CPEC has also shown significant industry concentration, focusing on related fields such as oil and gas, pipelines, engineering design, and services. In this context, it is necessary to clarify the industrial goals and investment priorities of the upstream, midstream, and downstream as soon as possible: the upstream should always focus on oil and gas resource exploration and development, while the midstream should focus on the construction of liquefied natural gas storage facilities and oil reserves. For example, on the basis of expanding the storage and conversion capacity of Liquefied Natural Gas (LNG) receiving stations, new LNG receiving stations should be established. At the same time, by jointly developing and selling non-core businesses, collaborating and complementing advantages with well-known domestic and foreign engineering construction enterprises, further improving the operational efficiency of the enterprise, reducing sales costs while balancing its own debt, and utilizing remaining resources to invest in technological research and development, the problem of insufficient endogenous growth momentum can be solved. In addition, efforts should be made to optimize the internal investment structure to ensure that construction projects are carried out as planned and put into operation on time. This will not only improve the company's asset efficiency and cash flow but also enhance the overall asset utilization level.

5. Conclusion

This study compared past literature and valuation methods, based on the actual situation of the research object, used a modified discounted free cash flow model to evaluate the value of CPEC, and systematically sorted out its strategic direction through SWOT analysis. The following conclusions were drawn: Firstly, a valuation model suitable for energy engineering service enterprises was constructed by adjusting accounting subjects such as non-recurring gains and losses, financial expenses, and asset impairment provisions. The calculation results show that the estimation error between the model valuation and the actual market value of the company is only 3.336%, which verifies the effectiveness of the valuation method in reflecting the true value of the enterprise. Secondly, although CPEC has advantages such as technological accumulation, full industry chain, and brand influence, it also faces internal challenges such as low fixed asset turnover efficiency, relatively insufficient research and development investment, and weak cost control capabilities. In the external environment, the continuous investment in domestic oil and gas infrastructure and the international market bring development opportunities, but international oil price fluctuations, intensified industry competition, and trade protectionism also pose significant threats. Based on the above analysis, it is recommended that the company optimize its operations from three aspects: first, expand diversified financing channels, make reasonable use of debt instruments and accounts receivable factoring, and enhance its ability to raise funds; Secondly, will promote the optimization of asset structure, strengthen the full cycle control of projects, and improve the efficiency of asset utilization and cash flow level; The third is to focus on core business while moderately extending to high value-added areas such as front-end design and back-end operations, enhancing endogenous growth capabilities. Future research can further combine ESG elements with social responsibility performance to explore a more comprehensive evaluation system for energy companies, providing a reference for value management and strategic decision-making of similar enterprises.

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