Multidimensional Comparison Method for Overseas Asset Operations of Power Grid Enterprises

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Abstract. As a new force and vanguard of China's "going global" strategy, power grid enterprises need to attach great importance to international business development, continuously improve their overseas asset operation capabilities and risk prevention capabilities. Solve the problems of insufficient application of overseas asset operation indicator management, insufficient guidance of indicator system, and insufficient analysis of indicator system. This article proposes a comparative method for overseas asset operation of power grid enterprises and a method for setting operational indicator warning thresholds. In the vertical time dimension, a comparison method combining "operational index and key indicators" is adopted. In terms of horizontal project dimensions, the indicators of each project are mainly described from the perspectives of current value and change rate. In terms of warning function, the indicator warning threshold is determined through two methods: with reference standards and without reference standards.

Keywords: power grid enterprise, overseas assets, indicator management, project comparison, early warning analysis

1 Introduction

Since the proposal of the "going global" strategy, China's foreign investment and asset operation have achieved rapid development[1], and the investment scale has ranked among the top in the world. However, there is still a certain gap between China and the goal of building a strong foreign investment country in terms of international business capabilities and international competitiveness cultivation[2]. The 14th Five Year Plan for National Economic and Social Development and the Outline of Long-term Objectives for 2035 propose to "accelerate the construction of a new development pattern with domestic circulation as the main body and domestic and international dual circulation promoting each other", "support enterprises to integrate into the global industrial chain supply chain, and improve cross-border business capabilities and levels". The report of the 20th National Congress of the Communist Party of China emphasizes the need to "improve the quality and level of international circulation", providing clear guidance for promoting high-quality investment and operation of overseas assets in China.

V. Gaikar et al. (eds.), *Proceedings of the 2023 3rd International Conference on Financial Management and Economic Transition (FMET 2023)*, Advances in Economics, Business and Management Research 262,
https://doi.org/10.2991/978-94-6463-272-9_28

As a new force and vanguard of China's "going global" strategy, power grid enterprises attach great importance to international business development and regard it as an important lever for building an internationally leading energy internet enterprise[3]. Currently, the concept of overseas asset operation for power grid enterprises has shifted from "large-scale mergers and acquisitions of incremental assets" to "lean operation of existing assets". However, there are still problems such as insufficient application of operational indicator management, insufficient guidance of indicator system, and insufficient analysis of indicator system[4].

2 Comparative Methods for Overseas Asset Operations

For overseas assets operated by power grid enterprises, a project comparison method for overseas asset operation is proposed from the vertical time dimension and the horizontal project dimension, respectively[5]. The B project and C project of a certain power grid enterprise were selected for comparative analysis.

2.1 Single project vertical comparison

Methodological approach.

The first step is to select all indicators of a certain dimension in the project operation management indicator system, calculate the asset operation index of that dimension, and describe the overall situation of asset operation. For example, select all operational management indicators from the C project indicator system and calculate the C project operational management index. The asset operation index is calculated by summing the normalized score and weighted weight of the indicator[6]. The normalized score of the indicator is calculated based on the ratio of the current value to the historical value of the indicator[7], and the indicator weight is calculated using the AHP method[8]. The standard line for setting indices and indicators is 80 points. Exceeding 80 points indicates that the current value is better than the historical value. The second step is to determine a few key indicators based on all indicators of a certain dimension in the project indicator system, and calculate the normalized score of that indicator. For example, among all operational management indicators in the C project indicator system, unit gross profit OPEX and unit asset CAPEX are selected as key indicators. The third step is to analyze the operational situation of a certain dimension of the project, while comparing the operational index scores and key indicator scores. By comparing them with the standard line for comprehensive analysis, a conclusion can be drawn.

Empirical research.

The first step is to select all indicators in the operation management category of the C project indicator system and calculate the C project operation management index. The second step is to select unit gross profit OPEX and unit asset CAPEX as key indicators in the C project operation management category, and calculate the normalized scores of these two indicators. The third step is to compare the scores of

the operational index and key indicators, conduct a comprehensive analysis, and draw a conclusion. As shown in Table 1.

Table 1. Vertical Comparison of C Project Operation Management Indicators

Index/Indicator	Current Index	Value Score
Operations management index	——	84.32
Unit gross profit OPEX	35.82%	94.37
Unit asset CAPEX	4.86%	88.91

The operation and management indices of Project C all exceed the standard line, indicating that from a vertical time dimension, the operation and management of this project are superior to historical or base period levels. From the perspective of specific operational management indicators, the overall level of operational management is most driven by the improvement of unit gross profit OPEX indicator management, followed by the improvement of unit asset CAPEX indicator management.

2.2 Horizontal comparison of multiple projects

Methodological approach.

Fully consider the differences in equity nature, location, business type, and development stage of each project, mainly describe the indicators of each project from the perspectives of current value and change rate, and do not use methods such as calculating comprehensive scores for horizontal evaluation of the project.

The first step is to group projects based on the nature of equity, type of business, or location. For example, it can be divided into wholly-owned and non wholly-owned holding groups, or distribution and transmission groups, or Latin American, Australian, European, and Asian regions. The second step is to select common indicators from the operational effectiveness and management indicators for each group of projects, and the selection of indicators should focus on goal and independence. The third step is to display the current value and growth rate of absolute value indicators. For relative value indicators, display the current value and changes in value. The fourth step is to visually compare and display the growth rate or change value of the project, analyze the characteristics of each project's operation, and form a report.

Empirical research.

The first step is to group the projects according to their location, and select the operational management indicators of Project B and Project C from 2018 to 2021 for horizontal comparison. The second step is to select common indicators from the operational management indicators for each group of projects, such as average asset income, unit asset CAPEX, unit gross profit OPEX, etc. The third step is to display the current value and changes in relative value indicators. As shown in Table 2.

Table 2. Comparative Analysis of Project C and Project B

Indicator	Project C				Project B			
	2018	2019	2020	2021	2018	2019	2020	2021
Average income per unit asset	20.19%	21.55%	20.05%	19.04%	10.14%	8.24%	8.48%	9.76%
Unit asset CAPEX	4.86%	5.10%	5.84%	5.75%	0.70%	7.54%	0.96%	0.33%
Unit gross profit OPEX	35.82%	33.74%	33.01%	28.69%	10.99%	13.28%	14.30%	13.27%
Unit Asset OPEX	7.23%	7.27%	6.63%	5.46%	1.11%	1.09%	1.30%	1.29%

In absolute terms, the average net income of project C's assets (about 20%) is higher than that of project B's assets (about 9%). From a trend perspective, the average net income of project C's assets shows a trend of first increasing and then decreasing, while the average net income of project B's assets shows a trend of first decreasing and then increasing.

It is worth noting that Project C has increased CAPEX expenditure since 2020, and its average income per unit asset has shown a downward trend. At this point, collaborative analysis can be conducted by referring to indicators such as average net profit of assets, and it is found that the average net profit of assets of the project is showing an increasing trend.

In absolute terms, except for the addition of ultra-high voltage projects to Project B in 2019, the unit asset CAPEX of Project C (about 5%) is higher than that of Project B (about 0.6%). On the trend, the unit asset CAPEX of Project C is increasing year by year, while the unit asset CAPEX of Project B fluctuates below 1%.

In absolute terms, the unit gross profit OPEX of project C (about 33%) is higher than that of project B (about 13%). In terms of trend, the unit gross profit OPEX of project C shows a decreasing trend compared to express delivery, while the unit gross profit OPEX of project B shows a slight fluctuation.

In absolute terms, the unit asset OPEX of Project C (approximately 6.6%) is higher than that of Project B (approximately 1.2%). From a trend perspective, the unit asset OPEX of Project C shows a decreasing trend, while the unit asset OPEX of Project B slightly increases.

3 Method for determining indicator warning thresholds

The determination of indicator warning thresholds can be divided into two situations for discussion: with reference standards and without reference standards. The determination of reference standard thresholds is mainly based on historical

experience, while the determination of non reference standard thresholds is mainly achieved through the analysis of historical data.

3.1 Determination of threshold with reference standards

For thresholds with reference standards, the standards that can be referenced mainly include clear regulatory requirements from regulatory agencies, such as SAIFI for regulatory requirements; Industry standards in the project location, such as RAP deduction rate; The historical experience of project operation can be taken as the average or extreme value of historical values in recent years, such as the amount involved in litigation; Planned budget situation, such as OPEX expenditure plan, etc.

3.2 No reference standard threshold determination

For indicators without reference standards, assuming that the historical data of indicator values follows a normal distribution in a large sample situation, the threshold is determined using the relevant theory of normal distribution. Assuming the historical data mean of the indicator value is μ， The standard deviation is σ， Then the following warning threshold interval can be constructed $(-\infty, \mu-2\sigma](\mu-2\sigma, \mu-\sigma](\mu-\sigma, \mu-0.5\sigma](\mu-0.5\sigma, \mu](\mu, \mu+0.5\sigma](\mu+0.5\sigma, \mu+\sigma](\mu+\sigma, \mu+2\sigma](\mu+2\sigma, +\infty)$.

To ensure the flexibility and practicality of indicator management, managers can choose a method to determine the indicator warning threshold based on actual needs, or compare the indicator warning thresholds determined by multiple methods to obtain a comprehensive threshold.

1) Single standard method

Indicator warning threshold = threshold determined according to industry standards

2) Comprehensive standard method

Indicator warning threshold = min (threshold determined according to regulatory requirements, threshold determined according to industry standards, threshold determined based on historical mean)

3.3 Empirical research.

1) Determine indicator warning thresholds based on regulatory requirements. As shown in Table 3.

Table 3. OPEX for Distribution Regulation of Project C (Million Reais)

Company	Regulatory Value	Actual Value	Threshold
S company	127.5	119.5	127.5
P company	1380.6	1030.3	1380.6
R company	978.8	783.8	978.8
Q company	500.3	294.4	500.3

2) Determine indicator warning thresholds based on industry standards. As shown in Table 4.

Table 4. RAP Deduction Rate for AC Transmission Line of Project B

Indicator	Transmission Industry Value	Actual Value	Threshold
Project B: RAP deduction rate	0.78%	0.23%	0.78%

3) Determine indicator warning thresholds based on historical experience. As shown in Table 5.

Table 5. B Project's Litigation Amount (Million Reais)

Indicator	2018	2019	2020	Actual Value of 2021	Threshold（Mean）
Project B： Amount involved in litigation	583.1	340.83	462.8	505.05	462.24

4) Determine indicator warning threshold based on planned budget. As shown in Table 6.

Table 6. OPEX of Project B (January to July)

Indicator	Current Year's Planned Value	Accumulated Value for the Current Year	Threshold(Uniform Progress 7/12)
Project B: OPEX	491.90	245.10	286.94

4 Conclusion

The horizontal and vertical comparison of overseas asset operations can expand the conclusions of indicator analysis and provide rich information for management decision-making. In terms of vertical time dimension comparison, the comparison method combining "operation index and key indicators" is adopted. On the one hand, the operation index of overseas projects is calculated to grasp the overall situation of project operation. On the other hand, select a few key indicators for data display to grasp the key details of project operation. In terms of horizontal project dimension comparison, fully consider the differences in equity nature, location, business type, and development stage of each project, and mainly describe the indicators of each project from the perspectives of current value and change rate. In terms of warning function, indicator warning thresholds are determined through two methods: with reference standards and without reference standards. The determination of threshold with reference standards is mainly based on historical experience information, while the determination of threshold without reference standards is mainly based on historical data to provide information.

Acknowledgments

This paper is a phased achievement of Science and technology projects of State Grid (Key Technologies and Applications for Overseas Asset Operation of SGCC under the New Situation, 1400-202357328A-1-1-ZN).

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