

Research on M&A Performance of Environmental Protection Enterprises under “One Belt and One Road”

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Abstract. Under the “The Belt and Road”, M&A has become the first choice for environmental protection companies to expand their business scope and enhance their competitiveness to win more PPP projects. This paper takes the Yongqing environmental protection merger and acquisition of Xiangyin Garden as an example, adopts factor analysis method to study the financial data of the company before and after the merger and acquisition, and analyzes the impact of this merger and acquisition on the environmental protection financial performance of Yongqing. The study finds that after the merger and acquisition, the financial performance of the company presents a fluctuating state. In addition to the decline in solvency, the profitability, operating capacity, and development ability have improved well in the first quarter of the M&A announcement and one year after the acquisition. Overall, it has played a certain role in improving the short-term financial performance of Yongqing Environmental Protection.

1. Introduction

Since the proposal of the "Belt and Road" strategy on September 7, 2013, various infrastructure projects along the Silk Road have emerged in an endless stream, including businesses such as soil remediation, atmospheric management, and environmental protection thermoelectricity, bringing huge scale to environmental protection engineering enterprises. However, with the increase in projects, the competition between environmental protection companies is also fierce. Companies are constantly expanding their scope and scope of business in order to win more PPP projects, but it is almost impossible to realize the scale effect and positive growth of the business only by virtue of their own short-term power. Therefore, mergers and acquisitions are the preferred route.

Hunan Yongqing Environmental Protection Corporation (abbreviated as “Yongqing Environmental Protection”) was established in 2004 and is the first listed environmental protection company in Hunan Province. Its main business includes the treatment of flue gas, heavy metal pollution, soil remediation and environmental protection thermoelectricity. In particular, in the past three years, the status of its soil remediation business is continuing to deepen into the core business of the company, and it is the first listed environmental protection company to undertake arable land remediation projects in China. With the promulgation of the "Soil Pollution Prevention Action Plan" policy, especially during the "Thirteenth Five-Year Plan" period, the focus of environmental protection management has shifted to the restoration of soil, and Yongqing Environmental Protection, as a veteran enterprise for domestic soil remediation, is in the present situation. Can be used as a model for environmental protection companies, Yongqing environmental mergers and acquisitions of Hunan silver garden for its first merger and



acquisition events, so this article selected this event to launch a research on environmental protection companies M & A performance. Specific mergers and acquisitions are as follows:

Yongqing Environmental Protection issued an announcement on September 18, 2014, announcing that it will acquire 80% equity of Zhuzhou Xiangyin Landscaping Engineering Corporation (abbreviated as Xiangyin Garden) for a 50 million increase in equity. The main business scope of Xiangyin Garden covers the landscaping engineering construction and general contracting of municipal public works construction, and it has two qualifications of municipal public construction contracting (grade 3) and urban landscaping (grade 2). The merger and acquisition of Xiangyin Garden can make Yongqing's environmental protection business area more extensive and comprehensive, especially in the field of soil remediation business.

2. Research Design and Empirical Analysis

2.1. Sample Selection and Data Sources

This article selects the quarterly report data of each year of Yongqing Environmental Protection M&A before and after two years (September 2012 to March 2017) as samples. The research sample comes from CSMAR Database, NetEase's financial network, and uses software such as Excel and SPSS19.0. The data is calculated and standardized so that factor analysis can be performed on each financial indicator.

2.2. Construction of M&A Performance Evaluation Index System

According to relevant research, this paper selects four indicators of solvency, development ability, operational ability, and profitability to evaluate the performance of mergers and acquisitions. Among them, the current ratio, cash ratio, and quick ratio are selected to evaluate the solvency; the profitability is analyzed by selecting the return on net assets, earnings per share, and operating profit rate; and the growth rate of net assets income is selected when evaluating development capability. The operating profit growth rate, while the specific evaluation indicators of operating capacity are mostly taken in terms of total asset turnover rate, liquidity assets turnover rate, but due to the types of enterprises studied in this paper are environmental protection companies, compared to manufacturing or retail industries. The nature of the industry is rather special. with less inventory, mainly to provide various types of services for the main business, and most of the business in recent years have adopted the PPP model, that is, the higher demand for cash flow, so this time in the choice of evaluation of operating capacity. At the time of indicators, relevant indicators that focus on cash flow are selected, including: return on operating cash flow from assets, ratio of operating net cash flow to debt ratio and cash flow ratio. Specific evaluation indicators are shown in Table 1.

Table 1. M & A performance evaluation index system

Indicator type	Indicator number	Index name
Solvency	X ₁	Current ratio
	X ₂	Quick ratio
	X ₃	Cash ratio
	X ₄	Roe
Profitability	X ₅	Operating profit margin
	X ₆	Earnings per share
	X ₇	Return on operating cash flow of assets
Operating capacity	X ₈	Operating cash flow to debt ratio
	X ₉	Cash flow ratio
Development ability	X ₁₀	Return on net assets growth rate
	X ₁₁	Operating profit growth rate

2.3. Empirical Analysis

The premise of the use of factor analysis is that there must be a strong correlation between the original variables. Firstly use SPSS19.0 software to measure the current ratio, quick ratio, cash ratio, ROE, operating profit ratio, earnings per share and net assets income growth of Yongqing Environmental Protection for each quarterly statement from September 2012 to March 2017. The 11 financial indicators (variables), such as rate, operating profit growth rate, return on operating cash flow from assets, net cash flow from operations, debt ratio and cash flow ratio, were analyzed to see if there was a correlation between these indicators. Therefore, the KMO test and Bartlett test are used to test the correlation between the indicators are as follows:

Table 2. Testing by KMO and Bartlett

Kaiser-Meyer-Olkin metric for sampling enough		.517
Bartlett's sphericity test	Approximate Chi-square	312.468
	df	55
	Sig.	.000

The closer the KMO test value is to 1, the more common factors among the original variables are, and as long as it is greater than 0.5, it means that the method of factor analysis can be used for research. The Bartlett sphere test aims to test whether the correlation matrix is a unit matrix because the initial hypothesis is that the correlation matrix is a unit matrix. Only by rejecting the original hypothesis can factor analysis be used to analyze the data. The smaller the general significance level (<0.05) indicates that the original hypothesis was rejected and factor analysis can be performed. As can be seen from Table 2, the test value of KMO is 0.517 (greater than 0.5), indicating that the number of common factors among the original variables has reached the standard of applying factor analysis. Bartlett's test statistic has a probability of 0.000 (less than 0.05), indicating that rejecting the original hypothesis is suitable for using factor analysis to research M&A performance.

The principal component method in the factor analysis method is used to extract the common factors, and in accordance with the eigenvalue criterion, the principal component whose eigenvalue is greater than or equal to 1 is selected as the common factor. The results of analysis using SPSS19.0 are shown in the following table:

Table 3. Explains the total variance

Ingredients	Initial feature value			Extract square and load		
	total	Variance %	accumulation%	total	Variance %	accumulation%
1	3.464	31.492	31.492	3.464	31.492	31.492
2	2.993	27.206	58.697	2.993	27.206	58.697
3	2.332	21.197	79.895	2.332	21.197	79.895
4	1.418	12.886	92.781	1.418	12.886	92.781
5	.384	3.492	96.273			
6	.265	2.408	98.681			
7	.084	.761	99.442			
8	.047	.430	99.872			
9	.012	.106	99.978			
10	.002	.020	99.998			
11	.000	.002	100.000			

Extraction method: Principal component analysis.

In Table 3, the variance contribution of the first factor is the largest, which is the first principal component, because the eigenvalue in the table shows 3.464, which means that 31.492% of the total amount of variation information contained in 11 variables can be component explanation and so on. The second factor can explain 27.206% of all variable variation information, the third factor can explain 21.197%, the fourth factor interpretation amount can reach 12.886%, starting from the fifth factor, the

characteristic value Both are less than 1, so the first 4 factors are extracted as common factors. These four factors reflect 92.781% of the total variability information, indicating less missing information and better extraction of public factors.

In order to clarify the significance of the factors and make each factor reasonably explained, SPSS 19.0 software was used to perform orthogonal variance rotation on the four common factors selected by Yongqing Environmental Protection Company to obtain the load matrix and compare each variable. The number of loads on the four common factors gives the economic meaning represented by each common factor.

Table 4. Load matrix after orthogonal rotation

	Ingredients			
	1	2	3	4
X ₁	-.205	.870	-.013	-.069
X ₂	.008	.842	-.030	-.283
X ₃	.093	.943	.136	-.117
X ₄	.350	-.183	.900	.006
X ₅	-.142	.087	.881	.245
X ₆	.013	.151	.920	-.175
X ₇	.995	-.010	.070	.023
X ₈	.997	-.039	.024	.011
X ₉	.996	-.053	.040	.017
X ₁₀	-.002	-.197	.016	.970
X ₁₁	.053	-.197	.029	.969

Extraction method : Main ingredient

Rotation : With Kaiser normalized orthogonal rotation

From Table 4, we can see that the first factor has a large load on the return on operating cash flow of assets, net cash flow from operations to debt ratio, and cash flow ratio, so it reflects the information of these variables and is called operational capacity. The second factor has a large load on the current ratio, cash ratio, and quick ratio, so it responds to the information of these variables, which are called solvency factors. The third factor has a relatively large load on ROE, operating margin, and earnings per share. The response to this variable is the information on this variable, which is called profitability factor. The fourth factor has a larger load on the growth rate of net assets return rate and operating profit growth rate. The response is the information of these two variables, which is called the development capacity factor.

Table 5. Ingredient score coefficient matrix

	Ingredients			
	1	2	3	4
X ₁	-.167	.169	.017	.324
X ₂	-.136	.227	-.051	.214
X ₃	-.102	.255	.016	.332
X ₄	.171	.121	.281	-.167
X ₅	.043	.065	.384	.045
X ₆	.035	.176	.323	-.147

X_7	.237	.151	-.139	.070
X_8	.237	.141	-.158	.058
X_9	.240	.139	-.151	.053
X_{10}	.114	-.201	.122	.436
X_{11}	.128	-.191	.117	.437

Extraction method : Main ingredient

Rotation : With Kaiser normalized orthogonal rotation

The scores of operational capacity, repayment ability, profitability, and development ability of each common factor are denoted by F_1 , F_2 , F_3 , and F_4 respectively. According to the score coefficient matrix of each common factor in Table 5, the following expressions are obtained:

$$F_1 = -0.167 \times X_1 - 0.136 \times X_2 - 0.102 \times X_3 + 0.171 \times X_4 + 0.043 \times X_5 + 0.035 \times X_6 + 0.237 \times X_7 + 0.237 \times X_8 + 0.240 \times X_9 + 0.114 \times X_{10} + 0.128 \times X_{11} \quad (1)$$

$$F_2 = 0.169 \times X_1 + 0.227 \times X_2 + 0.255 \times X_3 + 0.121 \times X_4 + 0.065 \times X_5 + 0.176 \times X_6 + 0.151 \times X_7 + 0.141 \times X_8 + 0.139 \times X_9 - 0.201 \times X_{10} - 0.191 \times X_{11} \quad (2)$$

$$F_3 = 0.017 \times X_1 - 0.051 \times X_2 + 0.016 \times X_3 + 0.281 \times X_4 + 0.384 \times X_5 + 0.323 \times X_6 - 0.139 \times X_7 - 0.158 \times X_8 - 0.151 \times X_9 + 0.122 \times X_{10} + 0.117 \times X_{11} \quad (3)$$

$$F_4 = 0.324 \times X_1 + 0.214 \times X_2 + 0.332 \times X_3 - 0.167 \times X_4 + 0.045 \times X_5 - 0.147 \times X_6 + 0.070 \times X_7 + 0.058 \times X_8 + 0.053 \times X_9 + 0.436 \times X_{10} + 0.437 \times X_{11} \quad (4)$$

In the above formulae, X_1, X_2, \dots, X_{11} are the variable value after normalization.

Since the variance contribution rate of each common factor has a different degree of interpretation of the original variable information, the composite score F is calculated by using the variance contribution rate of the four common factors as a weight, from the operating ability, debt repayment ability, profitability and development ability. Four dimensions to evaluate M&A performance, namely

$$F = 0.3149 \times F_1 + 0.2721 \times F_2 + 0.2120 \times F_3 + 0.1289 \times F_4 \quad (5)$$

According to the common factor score functions F_1 , F_2 , F_3 , and F_4 and the comprehensive performance score function F of merger and acquisition performance, the comprehensive score map of the merger and acquisition performance of Yongqing Environmental Protection from September 2012 to March 2017 and the score of public factors for each quarter of the company are obtained. As shown in Figure 1.

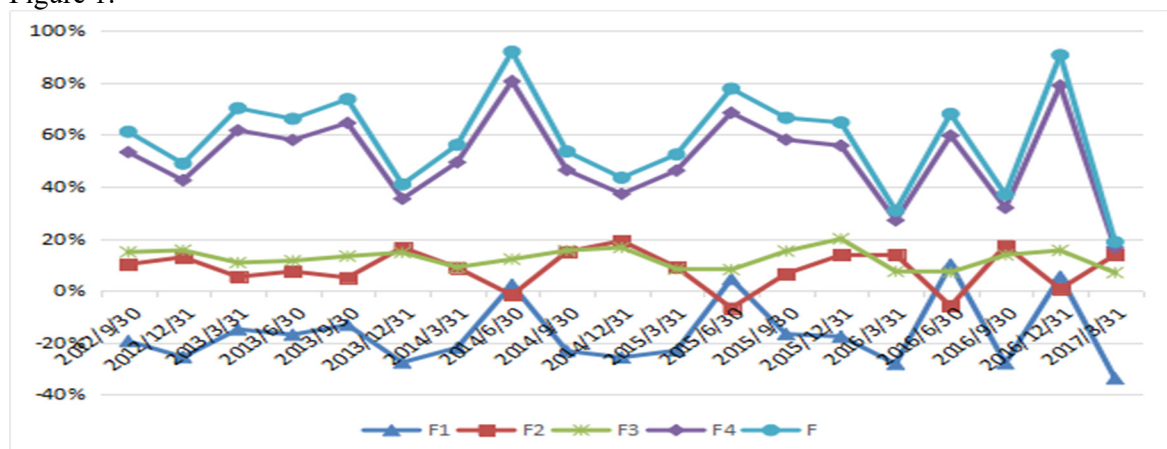


Figure 1. Trend of composite scores of common factor scores and merger performance

3. Analysis of results

As can be seen from Figure 1, operating capacity F1 has been stable from the previous quarter of September 30, 2012 to Yongqing Environmental Protection's announcement of mergers and acquisitions, and there has been a significant ups and downs since then. It is also higher than the pre-merger F1 score. The solvency F2 also remained stable from September 30, 2012 to the first quarter of Yongqing Environmental Protection's announcement of mergers and acquisitions. Later, it showed a change in the opposite direction from the operating capacity, which showed a general downward trend. Profitability F3 generally remained stable during the two years before and after the merger, but it had a slight upward trend after the merger and acquisition. Both the development capability F4 and the overall performance F were in fluctuations before and after the merger and acquisition, and the trend of change was consistent. Although there was no obvious trend of increase or decrease, there was an annual upward trend after the release of the M&A announcement. But afterwards, the downward trend appeared mostly.

Through the above description and analysis of the quarterly common factor scores and the comprehensive score trend chart of merger and acquisition performance, the following results can be drawn:

The operational performance of pre-merger companies has been maintained at around -20% to -10%, with low scores but stable movements. The fluctuations after mergers and acquisitions fluctuate greatly. They jumped on a steady basis before the merger and acquisition and scored the highest. Above 0, it shows that this merger has played an intermittent improvement effect on operating capacity. The pre-merger corporate solvency score is basically maintained at 0~10%, and the change is relatively stable, while the fluctuations after the merger are up and down, the highest value reaches nearly 20%, the lowest value is below 0, and the negative value is mostly, indicating this acquisition has reduced the level of solvency of enterprises. The profitability score remained between 10% and 15% before M&A and rose to nearly 20% in the first quarter after M&A, and profitability improved in the short term. Prior to M&A, development ability scores ranged from 40% to 65%, and reached 80% in the month of M&A. Later, it fluctuates, especially in the quarters after M&A compared with the corresponding quarter before M&A, and the development capacity basically increased by 4%. Mergers and acquisitions have improved the company's ability to develop. The comprehensive score of M&A performance remains between 50% and 90% before M&A. Compared with the score of the corresponding season before M&A after M&A, it can be seen that the score has increased by nearly 5%, so the overall M&A will be short-term financial for the company. The improvement of performance has played an active role.

Through the trend chart of M&A performance comprehensive scores, it can be found that the trend of change is basically the same as the fluctuation of operational capability and development ability, and the direction of fluctuation is the same. The short-term financial performance of the company is improved.

4. Conclusions and Inspiration

Taking the Yongqing environmental protection merger and acquisition of Xiangyin Garden as an example. The paper uses the accounting index method to analyze the performance evaluation index system of the M&A, and establishes five scoring functions of debt repayment ability, profitability, operational ability, development ability and M&A performance. And analyze them one by one. The results show that after the merger and acquisition, the financial performance of the company presents a fluctuating state. In addition to the decline in solvency, the profitability, operating capacity, and development capacity have improved well in the first quarter of the M&A announcement and one year after the merger. However, there has been no steady development trend since then, indicating that the overall M&A activity has played a certain role in improving the short-term financial performance of Yongqing Environmental Protection. Whether this M&A event is effective for a company for a long time still requires further analysis through future financial data.

Although Yongqing Environmental's merger and acquisition incident has brought about improvement in its short-term financial performance on the whole, it has also led to a drop in its solvency. The main reason was that a comprehensive, systematic, scientific analysis was not made

before this M&A activity was implemented. At present, under the background of the “One Belt One Road” with strong environmental protection demand, mergers and acquisitions will intensify. Therefore, if an enterprise wants to achieve sustainable development through mergers and acquisitions, it needs to correctly select the target company and conduct detailed and in-depth analysis of the target company’s financial performance, financial risk, market performance, and the status of various assets based on its strategic objectives or merger and acquisition motives. Select and determine the best target for mergers and acquisitions, and rationally integrate both resources and finances after mergers and acquisitions, so that mergers and acquisitions will play a good role in promoting the improvement of corporate financial performance.

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