

Performance Evaluation of the Biomedical Industry in Post-Epidemic Situations —Taking Fosun Pharma as an Example

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Abstract: In recent years, the biomedical industry has gradually become the focus of global competition. In particular, the outbreak of the COVID-19 in 2019 has made this industry a huge impact. The development of the entire industry today is affected by product and industry characteristics and a lot of uncertainty due to the epidemic. Therefore, it is more important to explore the performance level of today's listed companies in the biomedical industry and the future development direction. Based on this, this article will take the 2016-2020 annual report data of Fosun Pharma as a representative, use SPSS20 to perform time-series principal component analysis on the data, and use finance, operating ability, development potential, and product management as four subsystems. And then expand to 13 secondary indicators, trying to build a relatively complete and scientific performance evaluation system to comprehensively evaluate and analyze Fosun Pharma's performance. This survey shows that under the influence of COVID-19 in 2019, financial capabilities, operational capabilities, and development capabilities have all stagnated. After 19 years, financial and operational capabilities have recovered, and product management capabilities and development capabilities have shown a downward trend. It can be concluded that leading companies have a strong ability to respond to crises, but they should actively seek out the source of obstacles to development and continue to pay attention to whether their products will improve as the epidemic situation eases or need new production directions. The government should also actively introduce corresponding policies to help ease pressure on the industry.

1. Introduction

1.1 Research background

The intensified population aging and the outbreak of COVID-19 in 2019 have accelerated the biomedical industry to become the focus of global competition. China is also paying more and more attention to the development of the biomedical industry. At present, the introduction of various favorable policies and the vast potential market has formed a supporting advantage for the development of the biomedical industry. However, due to the high standards and requirements of products, as well as the inherent high investment, high risk, and long-term characteristics of the industry, there are also some obstacles to the development of the entire industry, such as low conversion rate of R&D achievements, product quality problems, and poor corporate operation. Therefore, exploring the performance level of listed companies in the biomedical industry plays a vital role in developing the industry.

By establishing a more comprehensive and complete performance evaluation system, this paper analyzes the performance of company Fosun Pharma before and after the epidemic. As a result, it can find shortcomings in its operation links and find out the current shortcomings to strengthen the company's performance evaluation. At the same time, it enables the management to strengthen the

importance of the impact of corporate performance evaluation on corporate development to improve operating methods and improve corporate performance rationally. Meanwhile, since Fosun Pharma is the leading company among listed companies in China's biomedical industry, it has reference significance for other companies to improve their corporate performance. In addition, corporate performance evaluation is conducive to strengthening the government's understanding of the development status of the entire biomedical industry, especially the dynamic changes under the influence of the epidemic, in order to grasp the development trend of the industry's general direction and formulate relevant support methods such as technology and economic policies to guide the healthy development of the industry. Therefore, this research is also significant for the government to exert macro-control and promote economic growth.

1.2 Literature review

Yang used the BSC method and combined the AHP method with the Delphi method to assign weights to the four dimensions of performance, analyzed the importance of different dimensions, and explored and found that financial factors are the critical dimensions of performance evaluation [1]. Alwaer found that the proposal and application of KPI are conducive to promoting employees' attention to key performance indicators, thereby improving work performance in a targeted manner and further improving the enterprise's overall performance [2]. Wen based on the "triple bottom line" theory, starting from the three aspects of society, economy, and ecology, and combining performance evaluation objects, evaluation content, and evaluation process, constructed a cube sustainable development performance evaluation system. The performance of real estate companies is selected for evaluation. Research shows that the Cube sustainable performance evaluation system can comprehensively coordinate and scientifically promote sustainable corporate strategies [3]. Leszczuk evaluates the performance of Internet companies from the quality of Internet media delivery services and quality experience and uses KPIs to divide corporate performance indicators into collection, processing, transmission, and display to evaluate different aspects of performance [4].

From the above research literature, it is clear that most of the current articles on the construction of the corporate performance evaluation index system combine financial indicators with non-financial indicators. And they try to combine the characteristics of different social backgrounds and industries, then select suitable ones from multiple perspectives such as society and ecology. In addition, scholars have gradually tended to use various evaluation methods for enterprise performance influencing factors exploration or performance evaluation. Therefore, the current establishment of the corporate performance evaluation standard system is relatively mature, which has important reference significance for this article. Still, a very small number of scholars have incorporated the time dimension into the evaluation dimension. Therefore, this article attempts to combine the time series with the principal component method. And then concentrate on a more detailed and accurate study of the dynamic changes in the performance of biomedical companies.

1.3 Research framework

First, it mainly introduces the background and significance of the research in this article and explains that the main research content of this article is the change of comprehensive performance evaluation of Fosun Pharma biomedical companies during the COVID-19 pandemic. At the same time, it summarizes the relevant literature on corporate performance evaluation methods and indicator systems and explains the inspiration and guidance it brings. Secondly, it explains the selection of the indicators of the article, the source of the data, and the explanation of the software used by the research. After that, take yearly units, take the data of the 5 most recent units, and use the time series principal component analysis method to conduct an empirical analysis on the performance evaluation of Fosun Pharma enterprises. Finally, through empirical analysis, it is tested whether the epidemic impacts biomedical companies, the problems that appear in the performance evaluation at the current stage, and the adjustment ideas for performance improvement are proposed.

2. Methods

2.1 Literature analysis method

By consulting literature related to the research object, it includes not limited to books, periodicals, magazines, or newspapers. Some news websites, government portals are also important sources of information. The data is collected, sorted and analyzed, and on this basis, the necessary conclusions are drawn through exploration, and conclusions are drawn based on their learning and practical experience. For example, this article draws on the previous essays of the main content and indicators of corporate performance evaluation, which intends to make the establishment of this article's evaluation system more comprehensive, objective, and accurate. And it has obtained much important information from the website, learned about the development status of Fosun Pharma company and what measures it has taken to promote performance improvement, and played a very important role in the discovery of follow-up problems of the article the proposal of countermeasures.

2.2 Time series principal component method

This article uses time series principal component analysis to evaluate the comprehensive performance of Fosun Pharma. By combining time series and principal component analysis, the development process of the comprehensive performance of the enterprise is displayed objectively and dynamically. At the same time, principal component analysis can try to ensure the completeness of statistical data information. Under the circumstances, the analysis process is more concise and clear by extracting representative main components to analyze the problem accurately.

3. Results

3.1 Performance indicator system

The choice of performance indicators is the basis of performance evaluation. Therefore, only by constructing an appropriate performance index system can the performance level of the enterprise be evaluated. As a high-tech industry with distinctive products, the biomedical industry combines its inherent characteristics. Based on the characteristics of the industry and drawing on the systems established by others, this article focuses on establishing a performance evaluation index system from four dimensions: financial status, operating capabilities, development potential, and product management.

1) Finance

The financial status shows how the company is currently developing. This article selects operating profit rate, net profit rate, and increased main business revenue and net assets per share as sub-indicators.

a) Operating profit margin

Operating profit margin refers to the operating profit from operations as a percentage of operating revenue. This percentage can comprehensively reflect the profitability of a product or service of an enterprise or an industry.

b) Net profit margin

Net profit is a net income that takes into account business profit and net income not directly related to day-to-day business activities, as well as after-tax profit. Net profit margin can also reflect the profitability of the operation very well.

c) Increase rate of main business revenue

The increased rate of main business revenue refers to the ratio of the increase in business revenue this year to the total business revenue of the previous year. Reflect on the increase or decrease in business income of the enterprise.

d) Net asset value per share

The net asset value per share reflects the company's net asset value represented by each claim, and is an important basis for supporting the stock market price. Usually indicates the ability to create profits and the ability to resist the influence of external factors.

2) Operating ability

Operation ability refers to the operating efficiency and effectiveness of corporate assets, which is mainly manifested in the conversion speed of assets between various forms and the comparison of their input and output. This article introduces the account receivable turnover rate, deposit turnover rate, fixed asset turnover rate, and total asset turnover rate to reflect the company's ability to use various assets to make profits.

a) Accounts receivable turnover rate

This indicator is expressed by the ratio of net credit sales to the average balance of accounts receivable over a period of time. It is an index to measure the turnover speed and management efficiency of the company's accounts receivable.

b) Deposit turnover rate

This indicator is the total amount of withdrawals in the banking system divided by the average balance of demand deposits in the banking system. It can be used to measure the current state of asset transactions.

c) Turnover rate of fixed assets

It refers to the ratio of the company's annual product sales revenue to the average net value of fixed assets. It can measure the utilization efficiency of fixed assets.

d) Turnover rate of total assets

It refers to the company's sales revenue ratio to the average total assets in a certain period. The turnover rate of total assets is an important indicator for comprehensively evaluating the operating quality and utilization efficiency of all assets of an enterprise.

3) Development potential

This aspect refers to the development trend and development potential of a company's future production and operation activities which is mainly realized by relying on increasing sales income, capital investment and profits. Still, this article mainly selects the corresponding indicators from the result of this ability, namely the continuous increase of asset scale and shareholder wealth.

a) Growth rate of total assets

It is the ratio of the growth of the company's total assets this year to the total assets at the beginning of the year, reflecting the growth of the company's asset scale during the current period.

b) Growth rate of net assets

This indicator refers to the ratio of the total net assets of the current period to the total net assets of the previous period. It is an important indicator to measure the changes in the company's total size and its growth.

4) Product management

In order to better fit the industry characteristics of the biomedical industry, this article includes its product R&D revenue, costs and customers into the evaluation scope, combined with the operability of the data. This article selects the pharmaceutical manufacturing and R&D revenue the top five customers account for the total annual business and cost rate as secondary indicators.

a) Revenue from pharmaceutical manufacturing and R&D

It refers to the revenue realized by pharmaceutical manufacturing and R&D business, which can measure the value of the R&D and manufacturing products.

b) The proportion of the top five customers in the total annual business

A large part of the revenue of biomedical companies comes from high-value customers. This article selects the proportion of the top five customers in the total annual business volume to represent the proportion of high-value customers, which can indicate the concentration of customer relationships and reflect whether the company has competitive products.

c) Cost rate

This index can evaluate the enterprise's ability to control costs and expenses and the level of operation and management, prompting the enterprise to strengthen internal management, save expenditure, and improve the quality of operation.

The overall index system is shown in Table 1.

Table.1. Fosun Pharma's performance evaluation index system

First level indicators	Secondary indicators	Label	unit
Finance	Operating profit margin	X1	%
	Net profit rate	X2	%
	Increase rate of main business revenue	X3	%
	Net assets per share	X4	Yen
Operating ability	Accounts Receivable Turnover Rate	X5	times
	Deposit turnover rate	X6	times
	Turnover rate of fixed assets	X7	times
	Turnover rate of total assets	X8	times
Development potential	Growth rate of total assets	X9	times
	Net assets growth rate	X10	%
Product management	Pharmaceutical manufacturing and R&D revenue	X11	Billion
	The proportion of the top five customers in the total annual business	X12	%
	Cost rate	X13	%

4. Empirical analysis

Organize the original data according to the set index system. The number of samples to be studied is 5, and the number of specific indicators is 13. And the principal component analysis method requires that the number of samples to be studied is greater than the number of indicators. Therefore, after referring to the relevant literature, the principal component analysis of the subsystem is adopted. Firstly, the original data is processed consistently to eliminate the differences between the indicators; secondly, the principal component analysis is performed on the four subsystems; conclusions are drawn based on the changes in the scores of the subsystems over the years.

4.1 Analysis of indicator correlation

Since the principal component analysis method integrates the conditions of various variables, and selects the most representative components after certain mathematical processing, there is a prerequisite for this, that is, there should be a strong correlation between the original variables. Therefore, the correlation of the original variables must be tested before the factor analysis. In this paper, Bartlett sphericity test and KMO (Kaiser-Meyer-Olkin) are used for correlation test. The analysis results are shown in Table 2.

Table.2. KMO and Bartlett test of each subsystem

Finance	Operating ability	Development potentialt	Product management	
KMO	0.717	0.577	0.5	0.583
Bartlett	17.839	24.727	3.549	7.678
df	6	6	6	3
Sig	0.007	0.000	0.06	0.053

4.2 Analysis of indicator correlation

Extract the principal components from each subsystem, and extract the principal components from each subsystem separately based on the principle that the cumulative contribution rate is greater than 80%. Among them, the main components are extracted from the financial status, operating capacity, development potential and product management, and the cumulative contribution rate of the main components is greater than 80%. (See Table 3)

Table.3. The total variance explained by each subsystem

	components	Initial eigenvalue	Principal component extraction	
		Numerical value	Contribution rate (%)	Cumulative contribution rate (%)
Finance				
	1	3.568	89.194	89.194
	2	.412	10.297	99.491
	3	.018	.453	99.944
	4	.002	.056	100.000
Operating ability				
	1	3.245	81.135	81.135
	2	.752	18.806	99.941
	3	.002	.052	99.993
	4	.000	.007	100.000
Development potentialt				
	1	1.871	93.538	93.538
	2	.129	6.462	100.000
Product management				
	1	2.677	89.243	89.243
	2	.285	9.494	98.736
	3	.038	1.264	100.000

Calculate the scores of each system according to the principal component matrix and the cumulative contribution rate of principal components.

The specific analysis method takes the financial subsystem as an example and replaces the original 4 indicators with the extracted principal component comp_1. The linear combination of the new indicator values is:

$$\text{comp}_1 = (-0.229)*z_{x1} + (0.276)*z_{x2} + (0.277)*z_{x3} + (0.275)*z_{x4}$$

Same as:

$$\text{comp}_2 = (0.267)*z_{x5} + (0.296)*z_{x6} + (-0.301)*z_{x7} + (-0.243)*z_{x8}$$

$$\text{comp}_3 = (0.517)*z_{x9} + (0.517)*z_{x10}$$

$$\text{comp}_4 = (0.368)*z_{x11} + (0.340)*z_{x12} + (0.350)*z_{x13}$$

From the above expression, the comprehensive performance evaluation system is divided into four major subsystems: financial status, operating capability, development potential, and product management, as the first-level indicators to reflect the scores of each subsystem of Fosun Pharma in the 2016-2020 calendar years (see Table 4).

Table.4. Scores of each subsystem over the years

Year	Comp_1	Comp_2	Comp_3	Comp_4
2016	0.286502	-1.00665	-0.06087	-1.20116
2017	-0.03773	-0.77493	1.140192	-0.87448
2018	-0.06933	0.498343	0.472765	0.25122
2019	-0.06933	0.498343	0.472765	1.10054
2020	0.113089	1.45401	0.020359	0.7202

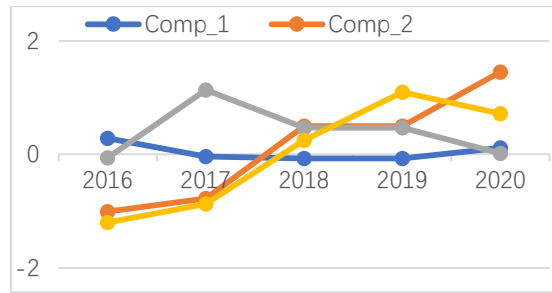


Figure 1. Line chart of the scores of each subsystem over the years

It can be seen from Table 4 and Figure I that the development trend of Fosun Pharma's financial status, operational capacity development potential, and product management from 2016 to 2020 is not consistent. Operating capacity and product management have increased significantly from the end of 2016 to the end of 2018, but its operating capacity has stagnated in 2019, and product management has continued to grow; however, in 2020, its operating capacity will be greatly improved. The scores for product management showed a rapid downward trend. In terms of development potential, there was a significant improvement in 2017, followed by a short period of stagnation, but the overall score continued to decline; the financial situation did not fluctuate much, and there was short-term fatigue in 2017, and the score increased slowly in 2018 and beyond.

5. Conclusion

5.1 Summary key findings

In general, Fosun Pharma's operational and product management capabilities continued to strengthen before the COVID-19 outbreak in 2019, while its financial situation remained relatively stable. The development capacity is unstable and has a downward trend. Under the influence of COVID-19, financial capabilities, operational capabilities, and development capabilities have stagnated. From the rapid recovery of financial and operational capabilities in 2020, it can be seen that Fosun Pharma, as one of the leading companies in China's biomedical industry, has a better ability to respond to external crises and can quickly resume stable operations. Operation. At the same time, society's demand for biomedical products is also one of the reasons for this trend change. Its product management has continued to rise since 2016, and the decline in 2020 may be related to the lagging impact of COVID-19, due to the long cycle of its products from R&D to production to sales. It is worth noting that if the impact of COVID-19 is not considered, Fosun Pharma's development capability is still in a downward trend.

5.2 Research significance

At the micro-level, efforts must be made to improve development capabilities. It can conduct an in-depth analysis of various details such as internal strategic management, find out the root cause hindering the development of the enterprise, and make improvements. At the same time, we must continue to pay attention to whether there are signs of improvement in product management. If there is a downward trend later, companies should pay attention to whether it is caused by other factors rather than the epidemic. Besides, as a leading company, the situation of Fosun Pharma has certain reference significance for other companies, and other companies can also analyze the gap between Fosun Pharma and the company to improve performance. In addition, the government should also provide further support policies, such as tax relief, government subsidies. Because mitigating the impact of COVID-19 on the economic situation is also an important driving force for promoting economic growth and bringing enterprises back on track.

5.3 Limitations and future studies

Firstly, the sample size is not large enough. Since the period from the outbreak of COVID-19 to the present is very short, the study only selected 5 years of data. The epidemic's impact is

continuous, and it is recommended to continue to pay attention to this issue in future studies. If the sample size can be expanded, the research results will be more accurate. Secondly, the availability of data and the subjectivity of indicator selection also influence the accuracy. Although this article combines financial and non-financial indicators to establish a performance evaluation system, the evaluation system is not perfect because of the perspective of data acquisition. In future research, if there is an opportunity to obtain internal data, the results will be closer to the actual situation of the enterprise.

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