



An empirical study of factor analysis on M & A performance of listed companies of Chinese pharmaceutical industry

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ABSTRACT

The article selects 13 financial indicators of listed companies to build the M&A performance of pharmaceutical industry evaluation system, and analyzes 38 Chinese listed companies in the pharmaceutical industry, uses factor analysis to analyze financial data samples from 2007 to 2012, extracts four common factors, establishes evaluation model of M&A performance, gets a composite score of M&A performance, and compares the M&A performance score results, then, judging from the result of the six years of M&A performance to show that the trend towards rising. According to the results of the factor analysis, we propose some political recommendations based on the microscopic aspects for the M&A in pharmaceutical industry and hope to promote the development of the pharmaceutical companies healthily and orderly.

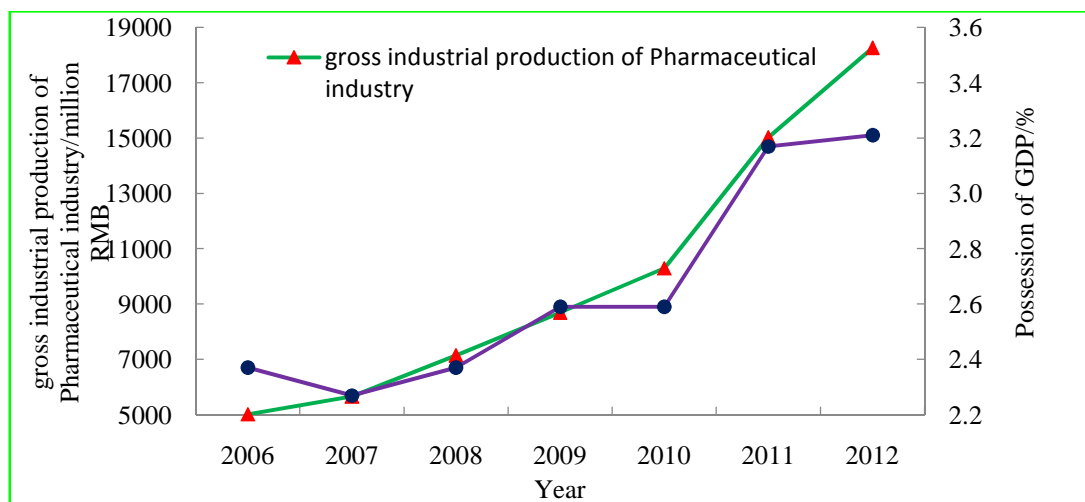
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INTRODUCTION

The growth rate of the pace of development of Chinese pharmaceutical industry is much faster than the international pharmaceutical industry's. In recent years, pharmaceutical industry is one of the fastest growing industries in China. [1] There is a positive correlation between the GDP and the total output value of pharmaceutical industry, the total output value of pharmaceutical industry occupy GDP a larger proportion and it is rising year by year (Figure 1), Gross industrial production for the pharmaceutical industry contribute GDP a lot, it plays an important role in national economy of China. "The 12th Five-Year Plan" predicts that we can still maintain a 20% average growth rate of industrial output value of the pharmaceutical industry to over 3 trillions in 2015.

Development of the pharmaceutical industry in relation to the national economy. April 7, 2009, "the recent focus on the implementation of health system reform program (2009-2011)" determine the period of medical reform plan for three years. In the planning process, more and more companies choose the path of mergers and acquisitions. In 2006, there are only 6 merger cases of domestic pharmaceutical industry, and the total acquisitions value is 4.6356 billion U.S. dollars. [2] Facing to the 2012 medical reform policy, the M & A activity in pharmaceutical industry began more rapid than the previous. However, there are 67 domestic companies choose mergers and acquisitions in 2012, the total value of M & A reached 16.9554 billion U. S. dollars. And whether these activities be brought to further improvement of business performance or not, the problem attracted the attention of many scholars. Therefore, this article has great practical significance. [3]

Figure 1 gross industrial production of pharmaceutical industry and GDP



EXPERIMENTAL SECTION

1.1 Basic assumption

(1) To obtain true and reliable financial indicators; (2) This article assumes that the effects of mergers and acquisition can be manifested in two years and the pre-merger corporate performance is stable, so using the financial date of 2007, 2008 and 2009 from the M&A companies as samples, selects the data the year before the M&A (Y_{-1}), the year of M&A (Y_0), the year after M&A (Y_1) and two years after the merger (Y_2); (3) Excluding the affection of macro and micro factors, such as national policy, the industrial environment, activities of investment, the impact of management changes and so on.

1.2 Selection and sources of sample

In this paper, we select companies out of 91 mergers and acquisitions of listed companies from 2008 to 2010 which issued by Shenzhen Stock Exchange and Shanghai Stock Exchange. According to the following restrictions, we select financial data in the acquisition interval (2007-2010). Firstly, the sample of mergers and acquisitions of listed companies has not been terminated listed so far; Secondly, excluding SP, ST and the companies of anomalies or incomplete data; Thirdly, choosing the largest M&A among several mergers and acquisitions. Taking these restricted conditions into consideration, finally we choose 38 listed companies as the valid samples.

In this paper, the data mainly from the GTA database, "China Securities News" and annual financial reports published by the sample listed companies.

Table 1 Indicator system

Aspect	Indicator code	Indicator name	Indicator calculation
Operating capacity	x_1	Inventory Turnover	Cost of sales/average balance of inventories
	x_2	Total Assets Turnover	Net sales revenue/average total assets
	x_3	Current Assets Turnover	Sales revenue /average balance of current assets
	x_4	Asset-liability Ratio	Total liabilities/total assets
Solvency	x_5	Equity Ratio	Total liabilities/total equity
	x_6	Current Ratio	Current Assets/ current Liabilities
	x_7	OPE	Main business profit/net sales revenue
Profit ability	x_8	Return on Total Assets	Net profit /average total assets
	x_9	ROE	Net profit /average net assets
	x_{10}	Ratio of Profits to Cost	Total profit/total cost
	x_{11}	Total Assets Growth Rate	Current total assets increased turnover/total assets at beginning of period
Growth ability	x_{12}	Earnings per share growth rate	Earnings per share growth/earnings per share of the previous period
	x_{13}	CROA	The current main business profit growth/main business profit of the previous period

1.3 Indication system

This article adopt the method of accounting indicators to conduct empirical research for M & A performance, this method is not simply to evaluate the related indicators, but to use these indicators perfectly.[5-6] According to the method we can obtain a new overall scores to reflect corporate performance. It is possible to reflect the company's

operating performance more comprehensively and objectively, it is not easy to be effected by the effectiveness of the capital market. The method of accounting indicators are selected thirteen major financial indicators from operating capacity, solvency, profitability and growth ability to reflect the performance of these four aspects of the enterprise (table 1).

1.4 An Empirical Study of M & A performance

1.4.1 Data Inspection

During the analysis, we must try to find whether there is a correlation between the variables, if there is no correlation between each variable, then extracting the common factors has little meaning. SPSS software provides statistics and Barelett's RMO spherical test statistic to test whether the data is suitable for factor analysis, RMO statistic values that between 0 and 1 and it used to test the suitability of the correlation between variables. The larger the RMO value is, the better the results of factor analysis. Barelett's sphere statistic used to test whether the correlation matrix is the unit matrix, if the correlation coefficient matrix is the expectation, there might be no correlation between variables, it would not be suitable for factor analysis. On the contrary, it is suitable for factor analysis.

When the original hypothesis is established, then Barelett's statistics obey approximate chi-square distribution. If the significance level is $\text{sig.} < 0.05$, then you can reject the Original hypothesis, and consider that the data is suitable for factor analysis.

From the under table, it can be seen that the significant level of overall data before and after the merger is $0.000 < 0.05$, meanwhile the RMO is 0.627. It indicating that the original variables are suitable for factor analysis and the result is relatively correct.

Table 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.627
Bartlett's Test of Sphericity	Approx. Chi-Square	322.621
	df	78
	Sig.	.000

1.4.2 The process of factor analysis

Using statistical software such as SPSS to analyze 38 listed companies which conduct M&A from 2008 to 2010 in the pharmaceutical industry, the analytical period including the year before M&A, the year of M&A, the year after M&A and two years after M&A.

Using factor analysis to extract common factor, according to the general principles of determining the number of common factors, we select the number of the value of characteristic roots greater than 1 as the number of common factor.[7] By observing the under table, there are four common factors, the cumulative variance contribution rate of four common factors is 0.75345, explaining 75.345% of the total variance of the original variables, the original information lost few variables, therefore, selecting the first four common factors is more appropriate.

Table 3 Total Variance Explained

Component	Initial Eigen values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.241	32.620	32.620	3.573	27.481	27.481
2	3.177	24.442	57.062	3.200	24.612	52.093
3	1.207	9.286	66.347	1.708	13.140	65.233
4	1.170	8.998	75.345	1.315	10.112	75.345
5	.946	7.274	82.619			
6	.558	4.289	86.908			
7	.504	3.877	90.785			
8	.475	3.657	94.442			
9	.299	2.299	96.741			
10	.240	1.848	98.589			
11	.102	.787	99.376			
12	.047	.365	99.741			
13	.034	.259	100.000			

The cumulative variance contribution rate of the year of M&A, one year after M&A, two years after M&A are as follows: 76.13%, 78.29%, 74.33%, these numbers are all in line with requirements.

Then, we can calculate the principal component scores. According to the value of the original factors and the factor

score coefficient matrix, it can be calculated each observables scores for each factor, thus we can further analyze the observations. [8]The rotated factor scores and results of the expression show in the under table.

Table 4 Rotated Component Matrix^a

	Component			
	1	2	3	4
x_1	.421	-.257	.121	.737
x_2	.852	-.052	.268	.294
x_3	.781	-.186	.140	.319
x_4	.759	-.225	-.158	-.268
x_5	.853	-.107	-.116	.065
x_6	.605	.177	.447	-.017
x_7	-.361	.809	-.086	.065
x_8	-.053	.892	.256	.028
x_9	.290	.855	.260	-.016
x_{10}	-.341	.799	-.040	.064
x_{11}	.209	.261	.745	-.182
x_{12}	-.109	-.018	.816	.209
x_{13}	-.029	.337	-.042	.649

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 7 iterations.

RESULTS AND DISCUSSION

We can acquire the following equations through the calculation of the above results, list them as follows :

$$\begin{aligned}
 X_1 &= 0.421x_1 + 0.852x_2 + 0.781x_3 + 0.759x_4 + 0.605x_5 + 0.605x_6 - 0.361x_7 - 0.053x_8 + 0.290x_9 - 0.341x_{10} + 0.209x_{11} - 0.109x_{12} - 0.029x_{13} \\
 X_2 &= -0.257x_1 - 0.052x_2 - 0.186x_3 - 0.225x_4 - 0.107x_5 + 0.177x_6 + 0.809x_7 + 0.892x_8 + 0.855x_9 - 0.799x_{10} + 0.261x_{11} - 0.018x_{12} - 0.337x_{13} \\
 X_3 &= 0.121x_1 + 0.268x_2 + 0.140x_3 - 0.158x_4 - 0.116x_5 + 0.447x_6 - 0.086x_7 + 0.256x_8 + 0.260x_9 - 0.040x_{10} + 0.745x_{11} + 0.816x_{12} - 0.042x_{13} \\
 X_4 &= 0.737x_1 + 0.294x_2 + 0.319x_3 - 0.268x_4 + 0.065x_5 - 0.017x_6 + 0.065x_7 + 0.028x_8 - 0.016x_9 + 0.064x_{10} - 0.182x_{11} + 0.209x_{12} + 0.649x_{13}
 \end{aligned}$$

Calculating composite scores: $F = \omega_1 X_1 + \omega_2 X_2 + \omega_3 X_3 + \omega_4 X_4$

Calculating composite scores for each listed company:

$$F_{-1} = \frac{27.481X_1 + 24.612X_2 + 13.14X_3 + 10.112X_4}{75.345}$$

According to the calculation we can obtain the value, F_{-1}, F_0, F_1, F_2 for each company, then we take the weighted average, Y_{-1}, Y_0, Y_1, Y_2 . For details, please to see table 5.

Table 5 Each Enterprise score

Ticker	F_{-1}	F_0	F_1	F_2
600222	-1.140740	-0.576338	-0.044538	-0.613340
002004	1.694492	-0.257063	-1.802801	1.407669
600789	-1.306269	-0.087163	0.201554	-0.545529
600781	1.019558	0.270492	-0.316494	-0.038857
600276	2.545025	1.025124	0.533482	-2.191250
600285	-0.349434	-1.247469	-1.148131	0.366962
000915	-0.927018	-0.057203	-0.050122	0.040855
000766	-2.344169	-2.496640	-2.172294	-1.026558
000705	-0.197047	0.516836	0.804590	0.332279
600518	0.188420	-0.326757	-0.871412	-0.238502
000566	-3.326399	-0.546911	-0.527614	-0.361973
000989	-0.473804	-0.275612	-0.221491	1.035156
000590	-1.385945	-1.477125	-2.096197	0.249076
000009	-0.311694	-0.625724	0.184735	-1.090853
000788	-1.047593	-0.359573	0.142132	-0.052164
000999	-0.616403	1.041206	0.024260	0.399168
600297	0.196320	-0.195809	0.838507	-0.591366
000513	-0.911448	0.974012	-0.267709	-1.801679
600466	-1.838716	-0.869314	-0.776403	-1.950015
600671	-1.410566	-3.270174	-2.034295	-0.231047
600656	-0.384280	-2.220402	-1.130395	0.635371
000597	2.037862	1.601849	0.333839	1.189415
600085	0.026621	-0.904430	-1.093110	-1.107412
000538	2.224467	0.991521	0.798284	0.711715
000963	3.894818	4.547739	3.415868	0.190442
000153	-0.773126	-0.286308	0.043421	0.440944
000411	3.817613	2.639856	3.773800	0.619836
600062	0.389818	0.519899	-0.210210	-0.163153
000028	3.714551	4.190679	3.365400	-0.958417
600530	-3.169747	-2.083442	-1.835301	0.749980
000623	-0.528873	-0.592334	2.028439	0.225428
002020	-1.148946	-0.699990	-0.080328	2.524301
600436	-0.575337	-0.412438	-0.402666	0.296800
600594	0.284361	0.163369	-0.108584	1.026058
002038	1.371690	0.368996	0.680989	-0.083896
600976	-0.152153	0.151017	0.317096	0.260130
002022	1.273670	0.502108	-0.486346	1.377974
000990	-0.491977	0.304011	0.620406	-0.325066

1.4.3 Comprehensive analysis of M & A performance

Based on the above analysis and calculation process by SPSS, we can get 38 companies consolidated scores(table 6):

Table 6 the total score of M&A performance

Performance score	Y_{-1}	Y_0	Y_1	Y_2
Total score	-0.003484	-0.001566	0.011325	0.018644

CONCLUSION

1. Research conclusions

According to corresponding composite score before and after the merger for all M & A sample for analysis, the trend of four total performance scores is rising. One year after the acquisition, performance increased from negative to positive, it indicating that mergers and acquisitions can improve and upgrade the performance of the enterprise markedly. After the year of M&A, Overall performance of pharmaceutical industry continued to increase over the previous year, but the rate of increase has slowed.

2. Policy suggestions

(1)Take cautious attitude in mergers and acquisitions, make sufficient preparation before mergers and acquisitions M&A is a means to improve business performance, not the only way to improve business performance, Enterprises should be based on their specific situation to choose whether to take M&A measures. Before taking M&A measures, companies should also conduct detailed market study to obtain adequate information. [9].

(2)Emphasis on the integration of the company after M & A

The purpose of the integration is to use the function of M&A, in the top factor analysis, the companies of M&A doesn't keep pace to the performance development of the year of M&A, this is due to some companies has not been effectively integrated after the M & A. In the process of integration, companies should focus on grasping the organizational systems integration, production integration, cultural integration.

(3)Improve laws and regulations about M & A

The market economy is legal economy, the development of the pharmaceutical industry must be have law to obey.[10] There are only two laws, "Company Law" and "Securities Law" to regular the development of company in China. Further, there is no consistent, standardized system of merger law in pharmaceutical industry. The Government should establish a sound legal system, regulate M&A of pharmaceutical companies to reduce the adverse impact of the acquisition on performance.

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