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## The evaluation on merger and acquisition' performance of the iron-steel corporations

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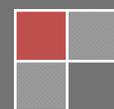
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### ABSTRACT

Recently the merger and acquisition become the popular method and instrument for improving the industrial concentration degree and corporation efficiency, especially in the iron-steel industry. However did the merger and acquisition realize the original aim and effect? So it is necessary and significant to measure the corporate performance after the merger and acquisition. This research focuses on this issue. To examine the real effect of the merger and acquisition on the performance, this paper starts from the status of the iron-steel industry and selects all financial data and the merger and acquisition events between 2001 and 2011, and then this paper uses the factor analysis method to evaluate the performance and uses the classified cluster method to classify the sample corporations. The empirical results show that the performance is not satisfactory in China's iron-steel companies after the merger and acquisition. In the conclusion the researchers analyzes the reasons and points out that the political management and intervene should be mainly responsible for these phenomenon. This research only focuses the particular industry-the iron-steel industry and uses continuous ten-year data to evaluate the performance, which makes its different from the before studies.

### KEYWORDS

The performance evaluation; The merger and acquisition; The iron-steel listed corporation.



## INTRODUCTION AND LITERATURE REVIEWS

Merger and acquisition (abbr. M&A) is the popular trend in the modern society and as for the enterprises, it is also the significant change from physical products corporate to the capital corporate for the sake of the improvement of the corporation competition. As the base of the national economy system, the iron-steel industry has been supporting the development of the national economy. However, because of the many historic problems, the iron-steel corporations scatter in many different cities, which results in the low industrial concentration and low efficiency. Under such circumstance, the iron-steel corporations began to merge in large at the beginning of this century in order to optimize and upgrade the industry. More ten years has passed and how did it come out? Many researchers and scholars have done much effort in evaluating the performance of the merger and acquisition because it can not only measure the effect of the merger and acquisition, but also better guide this process and behavior in the future. Hence this topic is very valuable and important to the practice.

According to the New Encyclopedia Britannica, merger corporate is combination of two or more independent business corporations into a single enterprise, usually the absorption of one or more firms by a dominant one. A merger way be accomplished by one firm purchased the other's assets with cash or its securities or by purchased the other's shares or stock or by issued its stock to the other firm's stockholders in exchange for their shares in the acquired firm, thus acquiesced the other company's assets and liabilities<sup>[1]</sup>. The simple definition was that merge was two or more enterprises become into one<sup>[2]</sup>. The acquisition was that one company (offer company) purchased the other company (goal company)'s asset or stock<sup>[3]</sup>. From the above authoritative definition, it is concluded that the international M&A has plenty connotation including merger, acquisition, consolidation, takeover and tender offer and so on.

The M&A performance measure is one of the important contents in this domain. Many researchers and scholars used different method and data to evaluate the performance and certainly summarized different conclusions. Loughran and Vjih (1997) took 947 corporations happened M&A during 1970-1980 as the samples and analyzed the five-year performance, they found that the M&A in stock had a sharp fall in income from investment; the M&A in cash had a little fall or a sharp rising in income from investment<sup>[4]</sup>. Bruner(2002) studied 13 literatures about the performance of the M&A and found that 4 researches supported performance rising after M&A; 2 researches supported performance significant falling after M&A; the other supported the second idea but not significant<sup>[5]</sup>. Tan Xiangqiu(1998) studied 198 M&A cases in the Shanghai stock exchange and constructed the post-M&A performance measurement system including 9 financial indexes. The conclusion show that the corporation performance in merger expansion was falling and the performance in stock transferring was a little improved and the performance in assets stripping, right offering and assets replacement was significantly enhanced<sup>[6]</sup>. Li Hongbin (2006) selected EDA method to analyze the pre-past financial data of M&A in order to clear M&A impact on the performance. The result showed M&A had no relate to the performance, even some negative impact on the performance<sup>[7]</sup>. Ding Zhiliang (2006)<sup>[8]</sup>, Tian Boping(2006)<sup>[9]</sup> pointed out the corporate performance would have a little fall after one year of M&A and on the whole the performance would be better than before and M&A has the positive impact on it. Homburg(2006) thought the efficiency of M&A was a key factor for the M&A performance and put forward the measurement method for production integration degree<sup>[10]</sup>.

This research summarized the important affairs happened in iron-steel listed companies from 2001 to 2011, and in consideration of the advantages and the disadvantages of the above literatures, this paper selected two method-the factor analysis and cluster analysis-to measure the performance. The

writers hope this research can scientifically and objectively evaluate the performance of M&A and then better guide the managerial behaviors.

## DATA AND SAMPLE COLLECTION AND STATISTICS

Considering the continuity of the corporate performance, this research collected 11-year data from 2001 to 2011. During this period, the sample corporation must experience one or more M&A affairs and it still exist until now. After screening, 26 iron-steel listed companies became the cases and the researchers obtained their financial data and M&A data from the Sinofin Economic and Financial Databases. As for the missing data, the researchers checked the annual report by hand.

On account of the data's discrimination in the quantity and dimension, the data had been normalized by SPSS16.0 and the factor analysis and cluster analysis had been done also by the same software.

## THE EMPIRICAL PROCESS AND RESULT

### Constructing the performance measurement index system

According to the theory of the performance evaluation, the writers constructed a comprehensive index system including 4 first-level indexes and 16 second-level indexes which express the profitability, anti-risk capacity, asset quality and development capacity.

TABLE 1 : The corporate performance measurement index system

| the first-level index | the second-level index                             | symbol |
|-----------------------|----------------------------------------------------|--------|
| asset quality         | profit to cost ratio                               | X4     |
|                       | cash to current liabilities ratio                  | X8     |
|                       | asset-cash return ratio                            | X12    |
| development capacity  | Operating income growth rate                       | X13    |
|                       | capital accumulation ratio                         | X14    |
|                       | total asset growth rate                            | X16    |
| anti-risk capacity    | debt ratio                                         | X5     |
|                       | time interest earned ratio                         | X6     |
|                       | quick ratio                                        | X7     |
| profitability         | Rate of Return on Common Stockholders' Equity(ROE) | X1     |
|                       | Return On Total Assets(ROA)                        | X2     |
|                       | time cash earned ratio                             | X3     |
| corporation capacity  | total asset turnover                               | X9     |
|                       | account receivable turnover                        | X10    |
|                       | working capital turnover                           | X11    |
|                       | Operating profit growth rate                       | X15    |

### The factor analysis process for the performance

#### Suitability test

Before analyzing the data, it is necessary to test the suitability to the factor analysis. Bartlett test of sphericity and KMO test are popular method to do it. The information in the TABLE 2 indicates it is suitable to the factor analysis.

TABLE 2 : KMO and Bartlett's Test Result

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy |                    | 0.651   |
|-------------------------------------------------|--------------------|---------|
| Bartlett's Test of Sphericity                   | Approx. Chi-Square | 3.078E3 |
|                                                 | df                 | 120     |
|                                                 | Sig.               | .000    |

### Extracting the factors

The high communalities show the extracted factors can explain mostly the information and the total variance explained output also shows there are 5 factors' eigenvalue is over 1 and their variance contribution rate respectively is 19.949%, 17.975%, 13.118%, 12.765%, 11.861%, therefore the cumulative percent is 75.668%. Therefore this research extracted 5 factors to express all the information of the indexes.

TABLE 3 : The final performance score

| Abbreviate name | 2001   | 2002   | 2003   | 2004   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| PGVT            | 0.907  | 1.125  | 1.640  | 2.455  | 1.655  | 1.726  | 2.372  | 2.271  | 0.484  | 0.622  | -2.507 |
| DYTG            | -0.022 | -0.145 | 0.024  | 0.506  | 0.503  | 1.421  | 1.525  | 1.460  | 2.102  | 4.119  | 1.909  |
| TGGF            | 0.734  | 1.187  | 3.314  | 6.044  | 2.644  | 2.312  | 9.955  | 3.121  | 3.098  | 5.562  | 2.995  |
| SGSS            | 4.154  | 8.367  | 45.270 | 34.275 | 14.760 | 20.449 | 40.763 | 46.247 | 9.457  | 4.715  | 3.159  |
| BSP             | 1.476  | 4.021  | 2.627  | 3.137  | 8.420  | 1.885  | 1.024  | 1.121  | 0.965  | 2.043  | 2.543  |
| XXZG            | 3.804  | 0.262  | 4.102  | 2.143  | 1.023  | 0.979  | 0.954  | 0.925  | 1.259  | 1.177  | 1.383  |
| TGBX            | 1.016  | 1.663  | 3.589  | 2.899  | 1.959  | 1.541  | 1.276  | 0.912  | 0.903  | 1.594  | 1.808  |
| AGGF            | 0.774  | 3.802  | 8.120  | 2.187  | 2.825  | 2.760  | 2.248  | 1.691  | 1.056  | 1.157  | 0.946  |
| HLGT            | 0.885  | 1.147  | 1.634  | 3.175  | 1.625  | 1.051  | 1.335  | 1.290  | 0.535  | 1.027  | 0.882  |
| SGGF            | 0.674  | 0.687  | 0.862  | 1.018  | 0.871  | 0.727  | 0.978  | 0.947  | 1.019  | 1.519  | 0.756  |
| WGGF            | 5.044  | 21.088 | 21.156 | 4.067  | 3.642  | 25.376 | 4.628  | 9.971  | 4.766  | 4.534  | 4.914  |
| BSU             | 1.453  | 1.072  | 2.130  | 3.101  | 2.520  | 1.716  | 1.811  | 2.167  | 1.671  | 1.283  | 0.932  |
| BAOSTEEL        | 1.918  | 1.316  | 1.475  | 2.111  | 1.778  | 1.337  | 1.531  | 0.985  | 0.859  | 1.610  | 5.116  |
| LGGF            | 1.170  | 1.200  | 1.760  | 2.612  | 2.804  | 2.402  | 2.113  | 2.382  | 5.293  | 8.566  | 3.030  |
| XNTG            | 0.264  | 0.263  | 0.248  | 0.358  | 0.306  | 0.402  | 0.631  | 0.546  | 0.365  | 0.765  | 1.376  |
| HGGF            | 2.756  | 5.225  | 4.956  | 4.343  | 2.989  | 3.312  | 2.886  | 3.114  | 3.111  | 3.709  | 5.666  |
| NXHL            | 0.393  | 0.206  | 0.131  | 0.105  | -0.063 | 0.217  | 0.357  | 0.346  | 0.186  | 0.302  | 0.673  |
| LYGF            | 1.740  | 2.512  | 9.864  | 19.457 | 39.365 | 5.681  | 5.536  | 3.513  | 4.079  | 5.028  | 7.256  |
| NGGF            | 4.555  | 0.732  | 5.156  | 1.905  | 1.871  | 1.199  | 1.770  | 2.767  | 2.566  | 1.913  | 2.096  |
| JGHX            | 1.126  | 1.812  | 3.495  | 2.237  | 1.278  | 1.162  | 1.544  | 1.251  | 1.437  | 1.932  | 3.942  |
| FSTG            | 0.315  | 0.194  | 0.024  | 0.269  | -0.015 | 0.086  | 0.244  | 0.338  | 0.422  | 0.345  | 0.217  |
| AYGT            | 1.004  | 2.248  | 5.450  | 6.983  | 8.804  | 11.548 | 19.038 | 3.555  | 2.413  | 2.338  | 1.200  |
| BYGT            | 25.06  | 1.207  | 2.131  | 3.834  | 5.201  | 3.180  | 4.917  | 40.106 | 74.592 | 55.920 | 59.512 |
| XGGF            | 0.504  | 0.535  | 0.477  | 0.625  | 0.565  | 0.719  | 3.817  | 1.170  | 0.775  | 1.266  | 1.095  |
| MGGF            | 0.455  | 0.924  | 1.899  | 1.936  | 2.133  | 1.508  | 1.422  | 1.670  | 1.336  | 1.376  | 1.231  |
| GGGF            | 0.351  | 0.324  | 1.047  | 1.235  | 0.927  | 0.388  | 0.595  | 10.231 | 0.834  | 2.554  | 1.619  |

### Calculating the score for every factor and the final performance score

According to the rotated component matrix and the component score coefficient matrix, the following formulas used to calculate the factor score are concluded:

$$F_1=0.073X_1+0.107X_2+0.193X_3+0.202X_4-0.081X_5-0.115X_6-0.085X_7+0.345X_8-0.36X_9-0.059X_{10}+0.059X_{11}+0.375X_{12}-0.018X_{13}+0.007X_{14}-0.077X_{15}+0.020X_{16}$$

$$F_2=0.000X_1+0.003X_2+0.049X_3-0.019X_4-0.008X_5-0.013X_6-0.004X_7-0.011X_8+0.056X_9-0.014X_{10}+0.037X_{11}+0.003X_{12}+0.338X_{13}+0.349X_{14}+0.061X_{15}+0.338X_{16}$$

$$F_3=-0.064X_1+0.014X_2+0.008X_3-0.122X_4-0.288X_5+0.393X_6+0.512X_7-0.049X_8+0.259X_9-0.110X_{10}-0.115X_{11}-0.082X_{12}+0.037X_{13}+0.000X_{14}+0.101X_{15}-0.47X_{16}$$

$$F_4=0.325X_1+0.247X_2-0.483X_3+0.274X_4+0.061X_5+0.004X_6-0.133X_7-0.129X_8-0.125X_9+0.157X_{10}-0.006X_{11}-0.226X_{12}-0.092X_{13}-0.041X_{14}+0.104X_{15}-0.005X_{16}$$

$$F_5=0.073X_1+0.029X_2+0.064X_3-0.141X_4+0.005X_5-0.013X_6-0.081X_7-0.022X_8+0.463X_9+0.173X_{10}+0.468X_{11}+0.023X_{12}-0.002X_{13}+0.034X_{14}-0.230X_{15}+0.035X_{16}$$

The next step is to calculate the final performance score and the formula and the output are as follows.

$$F_i = a_1f_1 + a_2f_2 + \dots + a_kf_k$$

Now we will do the K-Mean cluster analysis for the above output. Number of cluster is 5 and maximum iterations are 10. The output can be seen in TABLE 4-6.

From the TABLE 4, we know the software made twice iteration and after the first iteration, changes in cluster centers were separately 0.000, 5.973, 0.000, 0.000, and 0.000. After the second iteration, there was a little or no any change and the distance was 0.000. Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center was .000. The current iteration is 2. The minimum distance between initial centers was 41.753.

**TABLE 4 : Iteration Historya**

| Iteration | Change in Cluster Centers |       |      |      |      |
|-----------|---------------------------|-------|------|------|------|
|           | 1                         | 2     | 3    | 4    | 5    |
| 1         | .000                      | 5.973 | .000 | .000 | .000 |
| 2         | .000                      | .000  | .000 | .000 | .000 |

The information in the TABLE 5 indicates the included cases in every cluster and the distance to the cluster centers. The first cluster includes WGGF; the third cluster includes BYGT; the fourth cluster includes SGSS; the fifth cluster includes LYGF and the left 23 companies belong to the second cluster.

**TABLE 5 : Cluster Membership**

| Abbreviate name | cluster | distance | Abbreviate Name | cluster | distance | Abbreviate name | cluster | distance |
|-----------------|---------|----------|-----------------|---------|----------|-----------------|---------|----------|
| PGVT            | 2       | 4.777    | SGGF            | 2       | 3.690    | NGGF            | 2       | 4.723    |
| DYTG            | 2       | 4.691    | WGGF            | 1       | .000     | JGHX            | 2       | 3.033    |
| TGGF            | 2       | 9.217    | BSU             | 2       | 1.802    | FSTG            | 2       | 5.973    |
| SGSS            | 4       | .000     | BAOSTEEL        | 2       | 4.027    | AYGT            | 2       | 20.985   |
| BSP             | 2       | 7.182    | LGGF            | 2       | 7.705    | BYGT            | 3       | .000     |
| XXZG            | 2       | 4.246    | XNTG            | 2       | 5.105    | XGGF            | 2       | 3.931    |
| TGBX            | 2       | 2.390    | HGGF            | 2       | 7.217    | MGGF            | 2       | 1.991    |

|      |   |       |      |   |       |      |   |       |
|------|---|-------|------|---|-------|------|---|-------|
| AGGF | 2 | 6.451 | NXHL | 2 | 5.867 | GGGF | 2 | 9.013 |
| HLGT | 2 | 2.779 | LYGF | 5 | .000  |      |   |       |

TABLE 6 shows the outcome of the one-way ANOVA for every variable and it indicates the performances from 2001 to 2011 are significant because all the concomitant probability is 0.000. Hence it is very successful to divide the cases into 5 clusters.

**TABLE 6 : ANOVA**

|         | Cluster     |    | Error       |    | F       | Sig. |
|---------|-------------|----|-------------|----|---------|------|
|         | Mean Square | Df | Mean Square | df |         |      |
| per2001 | 138.848     | 4  | 1.315       | 21 | 105.572 | .000 |
| per2002 | 102.579     | 4  | 1.879       | 21 | 54.586  | .000 |
| per2003 | 514.010     | 4  | 4.485       | 21 | 114.619 | .000 |
| per2004 | 303.324     | 4  | 3.074       | 21 | 98.662  | .000 |
| per2005 | 360.326     | 4  | 5.224       | 21 | 68.981  | .000 |
| per2006 | 207.736     | 4  | 5.384       | 21 | 38.583  | .000 |
| per2007 | 346.830     | 4  | 17.229      | 21 | 20.130  | .000 |
| per2008 | 787.373     | 4  | 4.220       | 21 | 186.589 | .000 |
| per2009 | 1283.691    | 4  | 1.456       | 21 | 881.712 | .000 |
| per2010 | 692.070     | 4  | 3.651       | 21 | 189.577 | .000 |
| per2011 | 799.908     | 4  | 2.925       | 21 | 273.519 | .000 |

## CONCLUSION

The empirical output shows the characteristics of every cluster and now we will concrete analyze the performance for them.

The first cluster is WGGF and its change interval of the performance is [3.642, 25.376]. Twice M&A had happened in the company in 2007 and 2009. The performance score is 25.376 and after the first M&A, namely in 2008 the score is 9.971, the performance decreased suddenly, then the second M&A happened in 2009, and after that, its performance is almost unchanged in the low level. The result indicates the first M&A decreased the performance significantly.

The second cluster includes 23 companies and they are PGVT, DYTG, TGGF, BSP, XXZG, TGBX, AGGF, HLGT, SGGF, BSU, BAOSTEEL, LGGF, XNTG, HGGF, NXHL, NGGF, JGHX, FSTG, AYG, XGGF, MGGF and GGGF. The common characteristics are more than three times M&A had happened during the statistical period and the performance changed a little before and after M&A and on the whole, every company's performance is stable.

The third cluster is BYGT and its change interval of the performance is [1.207, 74.592]. Its M&A had happened in the company in 2003 and 2008. During the first M&A, the performance was unchanged and during the second M&A, the performance increased greatly from 4.917 to 74.592 and the result indicates the second M&A improved the performance significantly.

The fourth cluster is SGSS and its change interval of the performance is [3.159, 45.27]. Only once M&A had happened in the company in 2007. The performance changed a little from 40.763 to 46.247 and the result indicates the M&A improved the performance slightly.

The fifth cluster is LYGF and its change interval of the performance is [1.74, 39.365]. Only once M&A had happened in the company in 2008. After and before the M&A, the performance didn't change and it indicates M&A had not any effect on the performance.

In a word, from the above analysis, the M&A which happened in the iron-steel companies is not such good as we expect, even sometimes or in special samples the M&A had negative impact on the

company's performance and the performance has not been improved continuously after M&A. There are many reasons for this phenomenon, for example the unreasonable motivation for M&A, too much cost for M&A, the integration of invalid and so on. By carefully analyzing the procedure and process for every M&A in every case, we found the political factor should be mainly responsible for it. The local governments made two companies merge or intervene in considering the political purposes and these unreasonable behaviors went against the economic rules and resulted in the inefficient M&A.

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### REFERENCES

- [1] The New Encyclopedia Britannica, Encyclopedia Britannica, Inc., Volume Edition, **15(8)**, 34-35 (**1993**).
- [2] International Encyclopedia of the Social Science, Volume 9, Macmillan Co. & Free Press, NY, 249 (**1972**).
- [3] P.Newman, M.Milgate, J.Eatwell; Hu Jian translator. The New Palgrave Dictionary of Money & Finance. Beijing: Economy and Science Press, **38(7)**, (**2000**).
- [4] T.Loughran, A.Vijh; Do Long-term Shareholders Benefit from Corporate Acquisition? Journal of Finance, **1765-1790**, 52 (**1997**).
- [5] R.F.Bruner; Does M&A Pay? A Survey of the Evidence for the Decision-maker. Darden Graduate School of Business Administration, University of Virginia, Working paper March, (**2002**).
- [6] Tan Xiangqiu; The empirical research on the assets merger performance in shanghai stock exchange. China Securities Journal, **5-7**, 9 (**1998**).
- [7] Li Hongbin; The Based-on DEA Research on the merger and acquisition performance of the listed corporations. Special Zone Economy, **151-152**, 11 (**2006**).
- [8] Ding Zhiliang; The Empirical Research on the Control Right's Merger and Acquisition in Chinese Listed Corporations. Shang hai:Tongji University, (**2006**).
- [9] Tian Boping; Binary Relative Evaluation Model for M&A Performance Evaluation in China Listed Companies. Journal of Harbin Institute and Technology, **231-233**, 2 (**2006**).
- [10] Homburg; Speed of Integration really a Success Factor of Merger and Acquisition? An Analysis of the Role of Internal and External Relatedness. Strategic Management Journal, **347-367**, 27 (**2006**).