A Study on Financial Performance Evaluation of High-Tech Experprises in Liaoning Province using Factor Analysis

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Abstract — Financial performance is vital to high-tech corporations in Liaoning Province. This study aims at evaluating objectively the financial performance according to profitability, solvency, operating capacity and development capabilities. Using the method of factor analysis, empirical methods are used to analyze the financial performance. Results show that the overall financial performance in this case is weak. Companies with good performance benefit from excellent financial capacities of individual performance. But good performance of an individual financial capacity cannot absolutely enhance overall financial capacities, other individual financial capacities are needed to balance the development.

Keywords - High-tech Listing Corporation; Financial Performance; Evaluation; Liaoning Province; Factor Analysis

I. INTRODUCTION

A group of high-tech listed companies in Liaoning Province is one of the important subjects of high-tech development and innovation system construction. During the process of the integration of Liaoning Province into the “One belt one road” construction, the acceleration of new round of revitalizing the old industrial base, and the promotion of economic restructuring and upgrading, the group of high-tech listed companies play important roles in Liaoning Province. A good financial performance is a prerequisite for continuing operation and development of high-tech listed companies in Liaoning Province. Therefore, the financial performance of high-tech listed companies in Liaoning Province is evaluated and analyzed for improving the competitiveness of high-tech listed companies in Liaoning Province and providing the basis for economic development of Liaoning Province.

II. BASIC CONDITION ANALYSIS OF HIGH-TECH LISTED COMPANIES IN LIAONING PROVINCE

By the end of December 2014, there are 16 high-tech listed companies in Liaoning Province in total. With the rapid growth of the stock market, overall strengths of Liaoning Province high-tech listed companies are also continually growing. The industries of high-tech listed companies in Liaoning Province are widely distributed in scientific and technology researching, hydropower gas industry, information technology and manufacturing sectors. Manufacturing industry that accounts for 76% of the total number of industries, it is the largest proportion in the industries. IT industry accounts for 12% of total industry. The proportion of research technology industry is the same as the hydropower gas industry, which accounts for 6% of the total industry. Liaoning Province high-tech listed companies are mainly located in Shenyang, Dalian and Anshan, which account for 81.25 percent. It indicates that the regional distribution of the development of high-tech listed companies is unbalanced.

In this paper, the financial data as aspects of operating conditions of sample companies in 2014 are analyzed mainly from the financial, operational, debt and growth ability by using descriptive statistics. Table 1 is the Liaoning Province high-tech listed companies’ operation status in 2014, the outcomes are shown in table I.

<table>
<thead>
<tr>
<th>TABLE I</th>
<th>OPERATION STATUS ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The number of samples</td>
</tr>
<tr>
<td>ROE(%)</td>
<td>16</td>
</tr>
<tr>
<td>ROS(%)</td>
<td>16</td>
</tr>
<tr>
<td>turnover ratio of receivable(time)</td>
<td>16</td>
</tr>
<tr>
<td>inventory turnover ratio(time)</td>
<td>16</td>
</tr>
<tr>
<td>current ratio</td>
<td>16</td>
</tr>
<tr>
<td>quick ratio</td>
<td>16</td>
</tr>
<tr>
<td>asset-liability ratio(%)</td>
<td>16</td>
</tr>
<tr>
<td>growth rate of total assets(%)</td>
<td>16</td>
</tr>
<tr>
<td>increase rate of main business revenue(%)</td>
<td>16</td>
</tr>
</tbody>
</table>
III. EMPIRICAL ANALYSIS OF FINANCIAL PERFORMANCE EVALUATION OF HIGH-TECH LISTED COMPANIES IN LIAONING PROVINCE

A. Financial performance evaluation system design

According to the principles of constructing a comprehensive, independent, scientific and feasibility evaluation system based on the latest regulations of corporate financial performance evaluation jointly enacted by National Treasury, Planning Commission, Ministry of Personnel, Economic and Trade Commission, this study selects 14 financial indicators to construct finance performance evaluation system. The 14 financial indicators include ROE, return on total assets, sales margins, basic earnings per share, total asset turnover, inventory turnover, current asset turnover, accounts receivable turnover ratio, debt ratio, quick ratio, current ratio, main business revenue growth, the rate of turnover, accounts receivable turnover ratio, debt ratio, quick total asset turnover, inventory turnover, current asset return on total assets, sales margins, basic earnings per share, economic and trade indicators, financial evaluation system design. The above expression can be represented as a matrix form $X = AF + m$, in which $F$ are common factors. Common factors appear in expressions of study variables. The exact meaning of common factors need a concrete analysis based on actual problem. $A$ is factor loading matrix, is factor loading of matrix $A$, load factor is covariance of $X_i$ with $F_j$ and correlation coefficient between $X_i$ and $F_j$, which can represent dependence of $X_i$ on the $F_j$. can be used as the $i$-th variable weights in the $j$-th common factor. The greater the absolute value of $a_{ij}$ is, the stronger the correlation of $X_i$ and $F_j$ becomes, as well as the greater the load capacity of common factor $F_j$ to $X_i$. $m$ is called special factor, which particularly belongs to a component $X_i$ ($i = 1, 2, ..., p$ ) of the vector $X$. There is no interaction among each $m$, each $F$ and $m$. In addition, common degree of variables and variance contribution of $F$ have great significance for interpretation of factor analysis to final practical results [8-9].

B. Empirical analysis methods selection

Factor analysis was first presented by Karl Pearson and Charles Spearman through the study of individual psychological evaluation. Factor analysis is a mathematical statistics. Complex variables could be converted into several comprehensive factors representing relationships between them through appropriate treatment [8-9].

The basic idea of factor analysis is dividing different research variable categories. Research variables belonging to different categories have lower degrees of correlation. But research variables belonging to the same category have higher degrees of correlation. According to degrees of correlation between the study variables, variables with high degrees attribute to a class that are named common factors, which can show most of the contents of original information with few comprehensive factors[8-9].

Basic steps of factor analysis include preparing prerequisites, extracting the common factors, making common factors with higher name interpretability, calculating factor scores for each research variable. Weight ratio of constructing composite factors score is generated in the actual operation process. The whole operation process is logical and objective. Therefore, factor analysis method is used appropriately in this study to analyze the contents [8-9].

Assume that there are numbers of original research variables ($X_1, X_2, X_3, ..., X_p$), and standard deviation for each study variables is equal to value 1 and the mean value is equal to zero. Then the various research variables factors are expressed by a linear combination of numbers of factors ($f_1, f_2, f_3, ..., f_k$) [8]. Thus the mathematical model is

\[
\begin{align*}
X_1 &= a_{11}f_1 + a_{12}f_2 + a_{13}f_3 + \ldots + a_{1k}f_k + m_1 \\
X_2 &= a_{21}f_1 + a_{22}f_2 + a_{23}f_3 + \ldots + a_{2k}f_k + m_2 \\
X_3 &= a_{31}f_1 + a_{32}f_2 + a_{33}f_3 + \ldots + a_{3k}f_k + m_3 \\
\vdots \\
X_p &= a_{p1}f_1 + a_{p2}f_2 + a_{p3}f_3 + \ldots + a_{pk}f_k + m_p
\end{align*}
\]

The above expression can be represented as a matrix

\[X = AF + m\]

C. Sample selection and data sources

December 31, 2014 was selected for the analysis of the point in time. The study sample was 16 high-tech listed companies in Liaoning Province in 2014. After data collection, this study finds that three high-tech listed companies’ financial data are shown abnormalities with sustained losses for many years, respectively *ST Songliao B, *ST Dahua and *ST Jincheng. Therefore, these three companies’ data are removed. The financial data used in the study sample mainly comes from the public announcement and the companies’ public annual financial reports of 16 high-tech listed companies in Liaoning Province in 2014. In addition, part of companies name and other data also refers to the NetEase Data and the Sina Finance Data.

D. Standardization of financial performance indicator data

Standardization of data includes the same direction treatment of data with non-dimensional treatment. The treatment of same direction of data is property content of data. And the non-dimensional treatment is mainly to solve the problem of data comparability. By eliminating the different units and different magnitudes among the data, the raw data can be fully analyzed and evaluated[8-9].

The same direction processing of data with the following formula are as following,

\[Y_{xy} = \frac{X_{xy} - \mu}{\sigma}\]

(2)
In which \( N \) is an appropriate value, \( X_i \) is original data, \( Y_i \) is positive post data.

The non-dimensional treatment of data with the following formula,

\[
Y_i = \frac{(X_i - \bar{X})}{s}
\]  

Where \( \bar{X} \) is mean of \( X_i \), \( s \) is standard deviation of \( X_i \). After the index process, the mean of each index is equal to zero and variance is unit.

E. Empirical analysis process

Before proceeding factor analysis, this study needs to do correlation analysis to research objects to confirm the feasibility of this method. Generally, the analysis tools are Bartlett sphericity test and KMO test. In this paper, the two test methods are used to test the feasibility of factor analysis. The calculation of KMO value is 0.610 by the 14 original variables, which is larger than 0.5 indicating that the set of data suitable for factor analysis, the relevant outcomes are seen in table 2. The significance level value for Bartlett test is equal to zero. It means that the results illustrate the correlation matrix of variables correlation. And the study of the model could be used for further analysis. The survey of the applicability of factor analysis is completed to determine the contribution of each factor variance extracted factor. In this paper, principal component analysis is used to obtain extracted factors.

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative %</td>
</tr>
<tr>
<td>2</td>
<td>3.802</td>
<td>27.161</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.599</td>
<td>18.561</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>.732</td>
<td>5.229</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>.631</td>
<td>4.507</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>.408</td>
<td>2.914</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>.248</td>
<td>1.770</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>.088</td>
<td>.626</td>
<td></td>
</tr>
</tbody>
</table>

The results which come from SPSS17.0 software show that four factors are extracted, and the original variables 84.122% of the total variance is explained. Former four factors can make better research questions on the interpretation, the relevant outcomes are seen in table 3. Next, factor rotation is conducted to make the meaning of study factors more fully. \( X^1 \) (Basic earnings per share), \( X^1 \) (ROE), \( X^3 \) (profit margin), \( X^4 \) (total asset growth), \( X^5 \) (asset accumulation rate), \( X^2 \) (Main business revenue growth) these six indicators are very high load on \( F^1 \). These six indicators are explained by \( F^1 \) in detail. \( F^1 \) refers to financial factor. \( X^6 \) (Inventory turnover), \( X^7 \) (current asset turnover), \( X^2 \) (return on total assets), \( X^8 \) (accounts receivable turnover rate) these indicators are very high load on \( F^2 \). This situation of operational aspects of the business assets can be represented by these four indicators. \( F^2 \) is named operational factor. Similarly, \( X^{11} \) (current ratio), \( X^{10} \) (quick ratio), \( X^9 \) (gearing ratio) of these three indicators have a higher load on the third factor \( F^3 \), and all of them can be expressed in the case of solvency, known as compensation debt factor \( F^3 \). For the last factor \( F^4 \), indicator \( X^5 \) (total turnover) has a high load value on it. Thus the factor of development can indicate the ability of enterprises in the growth area. The final component score coefficient matrix is seen in table 4.
Through the above process steps, the formula of factor scores are obtained by correlation operation,

\[ F_1 = 0.223X_1 + 0.087X_2 + 0.165X_3 + 0.270X_4 - 0.024X_5 + \ldots + 0.211X_{13} + 0.216X_{14} \]  
\[ F_2 = 0.019X_1 + 0.304X_2 + 0.126X_3 + 0.006X_4 - 0.025X_5 + \ldots - 0.102X_{13} - 0.050X_{14} \]  
\[ F_3 = 0.017X_1 + 0.105X_2 + 0.195X_3 - 0.031X_4 - 0.074X_5 + \ldots - 0.169X_{13} - 0.097X_{14} \]  
\[ F_4 = 0.105X_1 - 0.136X_2 - 0.204X_3 - 0.031X_4 + 0.627X_5 + \ldots + 0.093X_{13} - 0.169X_{14} \]

The weights are equal to ratio of the cumulative variance contribution rate and the contribution rate. Different public factor scores weight different values, then this study finds a comprehensive high-tech listed companies’ financial performance score performance. The scores of different public factors are weighted to find a comprehensive score of high-tech listed companies’ financial performance. Comprehensive score is in the following,

\[ F = 0.315F_1 + 0.291F_2 + 0.279F_3 + 0.116F_4 \]  

Equation 8 shows that the financial performance of Liaoning Province high-tech listed companies can be reflected by 31.5% for financial factor, 29.1% for operating factor, 27.9% for debt factor and 11.6% for development factor commonly in 2014. In general, the impact of financial factor, operating factor and debt factor on the performance of high-tech listed company’s financial performance is larger than the influence of development factors.

IV. Empirical Result Analysis

In terms of operating conditions and debt paying ability, two companies, the first place of Shenyang chemical industry and Dalian third base, are much higher than the average. However, two aspects of performance score of the number of the companies are positive, which are less than the other two aspects of companies, it shows that high-tech listed companies in Liaoning have more difference from operation conditions and debt paying ability, but little in development and financial condition. From the composite scores expression, among factors F1,F2,F3,F4, the first three factors are more influential to financial condition of high-tech listed companies in Liaoning. The financial factor is the most important factor, which accounts for 31.5%, and the development factor accounts for 11.6 percentage, which is the least. But on the whole it is balanced.

Julong corporations have the best financial performance among the high-tech listed companies in Liaoning during 2014, whose main business is equipment manufacture especially financial tools. In 2014, its main business income is 113,346 million yuan, net profit is 36.96 million yuan,
which is worthy of the science and technology innovative equipment manufacturing enterprises that is well supported by Anshan. Although it is flourishing in the province, compared with national financial machinery manufacturing enterprise, its development condition is still weaker. GRG Banking, a high-tech listed company of general equipment manufacturing industry, mainly engaged in the production and sales of ATM, ACF and Note sorting, whose main business income is 315.191 million yuan, net profit is 807.45 million yuan, performs better than Julong corporations. Thus it can be seen that on a national scale, high-tech listed company’s performance is still weaker in Liaoning.

In conclusion, the rank distributions of high-tech listed companies in Liaoning still have some rules to follow. The reason why the top three high-tech listed company is ahead of the other companies is their good performances on single financial capacity. But that cannot definitely promote comprehensive financial ability, which still needs the other poor single financial capacity to balance the development. Thus, the company needs to consider the advantages and disadvantages of financial performance, analyze detail current situation of financial benefits, development ability, debt paying ability and operation ability conditions. These four aspects have effects on each other, promoting together, and both are indispensable. The development of hi-tech listed companies should also comply with the law, develop the advantage of strengths, and also the weaknesses [9-11].

ACKNOWLEDGMENT

This research is funded by doctor research project of Liaoning University of technology (X201407), humanity and social science research project of department of education of Liaoning province (W2015209), public research personnel training project of department of science of Liaoning province (2015004005), soft science research project of Heilongjiang province (GC13D209), social science plan fund project of Liaoning Province (L115CJL001).

REFERENCES


