Performance evaluation of Internet financial enterprises based on factor analysis- Taking Dongfang fortune Information Co., Ltd. as an example

Hongmin Zhang *, Yang Han
School of Finance, Harbin University of Commerce, Harbin, China
*Corresponding author e-mail: zhanghm0315@163.com

Abstract. In recent years, China's Internet enterprises and financial institutions have developed very rapidly. The combination of the two - Internet finance has a great impact on people's life. In the fierce market competition, the evaluation of the operating performance of Internet financial enterprises can not only provide investors with investment reference information, but also help managers find their problems in operation and management. Taking Dongfang wealth Information Co., Ltd. as an example, starting from profitability, solvency, operation ability and growth ability, this paper selects ten indicators: gross profit margin, return on total assets, return on net assets, current ratio, quick ratio, asset-liability ratio, total asset turnover, accounts receivable turnover, net profit growth rate and operating revenue growth rate, Factor analysis is used to evaluate its business performance.

Keywords: Internet finance, factor analysis, business performance.

1. Introduction

Internet finance refers to a new financial business model in which traditional financial institutions and Internet enterprises use Internet technology and information communication technology to realize capital financing, payment, investment and information intermediary services.

Since 2008, the added value of China's financial industry has maintained a sustained growth of nearly 20%, and its proportion in GDP has steadily increased from 4.02% in 2005 to 8.35% in 2016. The financial industry plays an increasingly important role in the national economy. With the continuous development of Internet technology and the continuous increase of residents' personal financial assets, the deep integration of the Internet and finance has become the general trend. By the end of 2016, the number of natural person A-share accounts with a circulation market value of more than 1 million yuan in China had been 1356800, accounting for 2.75% of all accounts, and the average growth rate of funds had reached 22.91%. Since 2009, the average growth rate of the number of natural person A-share accounts with a circulation market value of more than 1 million yuan in China has reached 18.36%. The increase in the number and proportion of natural person stock accounts with high market value means the improvement of residents' income and financial management awareness, bringing more funds into the financial industry, so as to promote the development of the Internet financial information service industry.

Dongfang fortune Information Co., Ltd. is an Internet service platform integrating internet financial portal platform, financial e-commerce platform, financial terminal platform and mobile terminal platform. Dongfang fortune has become an Internet service platform with the most significant number of users and the highest user stickiness in China, and has maintained a competitive advantage in the number of users and user stickiness for a long time, It has a leading market position.

2. Literature review

In recent years, many scholars have used factor analysis to evaluate the performance of enterprises. Mao Chaomei and Sun Jianbin (2019) took Suning cloud business as the research object, made an empirical analysis on their financial indicators by using factor analysis method, made a comparative analysis on the performance of Suning cloud business before and after strategic transformation, and
put forward relevant suggestions. Taking Suning Tesco as an example, Zhu Qi (2020) used factor analysis to evaluate its financial performance from the four dimensions of profitability, solvency, operation ability and development ability, and put forward some suggestions for the existing problems of Suning Tesco. Ouyang qiangbin (2017) evaluated and calculated the growth capability index of 50 mobile Internet concept stock enterprises listed on the A-share market by using factor analysis. Wang xinni (2020), using the financial data of 25 listed Internet enterprises in 2017 as samples, used factor analysis to select 13 indicators from five aspects to build a financial performance evaluation system, obtained the scores and rankings of each factor and comprehensive economic level, and gave reference opinions on improving the financial performance level of listed Internet enterprises in China.

3. Financial performance evaluation of Oriental Wealth Information Co., Ltd

3.1 Source of information

This paper selects the relevant financial data from 2007 to 2020. The main source of the data is the financial statements of Dongfang wealth Information Co., Ltd. from 2007 to 2020.

| Table 1. KMO and Bartlett test |
|--------------------------------|
| KMO and Bartlett test          |
| KMO sampling suitability quantity | .431 |
| Bartlett sphericity test       | Approximate chi-square | 276.217 |
|                               | Freedom                | 45 |
|                               | Significance           | .000 |

3.2 Index selection

This paper mainly selects ten financial indicators from four aspects: profitability, solvency, operation capacity and growth capacity, including gross profit margin, return on net assets, return on total assets, current ratio, quick ratio, asset-liability ratio, total asset turnover, accounts receivable turnover, net profit growth rate and operating revenue growth rate, It comprehensively reflects the financial performance of the enterprise.

3.2.1. Profitability

Profitability refers to the enterprise's ability to obtain profits, also known as the capital appreciation ability of the enterprise's funds. The general production performance is the amount and level of the enterprise's income in a certain period of time. This paper selects gross profit margin (x1), return on total assets (x2) and returns on net assets (x3) as indicators to measure the profitability of Oriental wealth.

3.2.2. Solvency

Solvency refers to the ability of an enterprise to repay long-term and short-term debts with its assets. It is an important symbol reflecting the financial situation and operating capacity of an enterprise. Whether an enterprise has the ability to repay its debts is the key to its healthy survival and development. This paper selects the current ratio (x4) and quick ratio (x5) as indicators to measure the solvency of Oriental wealth.

3.2.3. Operating capacity

Operating capacity mainly refers to the efficiency and benefit of operating assets. The efficiency of an enterprise's operating assets mainly refers to the turnover rate or turnover speed of assets. The higher the speed of capital turnover, the better the operation of the enterprise. This paper selects asset-liability ratio (x6), total asset turnover ratio (X7) and accounts receivable turnover ratio (x8) as indicators to measure the operating capacity of Oriental wealth.
3.2.4. Growth ability

The growth ability of an enterprise refers to the potential ability of an enterprise to expand its scale and strength. Through vertical analysis, the financial indicators of the enterprise are compared with previous years to roughly judge the development trend of the enterprise. This paper selects net profit growth rate (X9) and operating revenue growth rate (X10) as indicators to measure the growth ability of Oriental wealth.

3.3 Empirical analysis process

3.3.1. Construct factor analysis model

Factor analysis is a statistical technique to extract common factors from variable groups. Factor analysis can find the hidden representative factors in many variables, classify the variables with the same essence into one factor, reduce the number of variables, and test the hypothesis of the relationship between variables.

3.3.2. Validity Analysis

Make KMO test and spherical test on the data.

Because factor analysis needs to construct a small number of representative factor variables from massive original data, the original variables should meet the potential requirements of solid correlation, otherwise it is impossible to extract a few standard factor variables that can reflect the common characteristics of the original variables. In this paper, KMO and Bartlett spherical test are used to test whether the data are suitable for factor analysis. The test results are shown in Table 1. It can be seen from Table 1 that the sampling appropriateness of KMO test is $0.431 > 0.3$, which indicates that there is a partial correlation between variables and is suitable for factor analysis. The p-value of the spherical test is $0.000 < 0.001$, which indicates that there is the correlation between variables and provides conditions for the success of factor analysis.

3.3.3. Principal component analysis and extraction of common factors

It can be seen from Table 2 that most of the extracted values of common factor variance exceed 0.8, indicating that the variables are well expressed by factors.

Table 3 is the total variance interpretation table. The first column in the table is the number of factors, the second column is the characteristic root, the third column is the contribution rate, and the last column is the cumulative variance contribution rate. The eigenvalue of the first factor after rotation is 3.104, and the variance contribution rate is 31.035%; The eigenvalue of the second factor is 2.932, and the variance contribution rate is 29.321%; The eigenvalue of the third factor is 2.454, and the variance contribution rate is 24.539%. The cumulative variance contribution rate of the first three variables reaches 84.895%, indicating that these three factors can represent 84.895% of the total variance of the original ten financial performance management evaluation indicators, and can be used as three common factors to analyze the level of financial performance management.

| Table 2. Common factor variance |
|---------------------------------|
| Common factor variance          | Initial | Extract |
| Gross profit margin (X1)        | 1.000   | .850    |
| Return on total assets (X2)     | 1.000   | .907    |
| Return on net assets (X3)       | 1.000   | .880    |
| Current ratio (X4)              | 1.000   | .937    |
| Quick ratio (X5)                | 1.000   | .937    |
| Asset liability ratio (X6)      | 1.000   | .933    |
| Total asset turnover (X7)       | 1.000   | .843    |
| Accounts receivable turnover (X8)| 1.000 | .796    |
| Net profit growth rate (X9)     | 1.000   | .595    |
| The growth rate of operating revenue (X10) | 1.000 | .812    |

Extraction method: principal component analysis
### Table 3. Interpretation of total variance

| Component | Initial eigenvalue | Extract the sum of squares the loads | Sum of squares of rotating loads |
|-----------|--------------------|-------------------------------------|---------------------------------|
|           | Total              | Percentage variance | Accumulate % | Total              | Percentage variance | Accumulate % | Total              | Percentage variance | Accumulate % |
| 1         | 4.301              | 43.008               | 43.008       | 4.301              | 43.008               | 43.008       | 3.104              | 31.035               | 31.035    |
| 2         | 2.936              | 29.362               | 72.370       | 2.936              | 29.362               | 72.370       | 2.932              | 29.321               | 60.356    |
| 3         | 1.253              | 12.525               | 84.895       | 1.253              | 12.525               | 84.895       | 2.454              | 24.539               | 84.895    |
| 4         | .880               | 8.796                | 93.691       |                    |                      |              |                    |                      |            |
| 5         | .341               | 3.409                | 97.100       |                    |                      |              |                    |                      |            |
| 6         | .192               | 1.918                | 99.018       |                    |                      |              |                    |                      |            |
| 7         | .092               | .920                 | 99.938       |                    |                      |              |                    |                      |            |
| 8         | .005               | .049                 | 99.987       |                    |                      |              |                    |                      |            |
| 9         | .001               | .013                 | 100.000      |                    |                      |              |                    |                      |            |
| 10        | 4.824E-8           | 4.824E-7             | 100.000      |                    |                      |              |                    |                      |            |

#### 3.3.4. Common factor naming

To name the common factors, we need to build a rotated component matrix, determine a load of each enterprise's financial performance management index on each common factor, and clarify the meaning of the common factor.

It can be seen from Table 4 that the first common factor accounts for a large proportion in the three indicators of return on total assets, total asset turnover, net profit growth rate and operating revenue growth rate, which can reflect the asset utilization ability of the enterprise and is named as asset factor; The second common factor accounts for a large proportion in current ratio, quick ratio and asset-liability ratio, which can reflect the short-term solvency of enterprises, and is named short-term solvency factor; Among the third common factor, the larger ones are gross profit margin, return on net assets and accounts receivable turnover, which reflect the profitability of the enterprise and are named profit factor.

### Table 4. Composition matrix after rotation

| Component                        | 1     | 2     | 3     |
|----------------------------------|-------|-------|-------|
| Gross profit margin (X1)         | .080  | -.148 | .906  |
| Return on total assets (X2)      | .359  | -.172 | .866  |
| Return on net assets(X3)         | .845  | .138  | .384  |
| Current ratio(X4)                | -.133 | .958  | -.043 |
| Quick ratio(X5)                  | -.132 | .958  | -.043 |
| Asset liability ratio(X6)        | -.266 | -.926 | .071  |
| Total asset turnover (X7)        | .849  | .214  | .276  |
| Accounts receivable turnover rate(X8) | .398 | .168 | .780 |
| Net profit growth rate(X9)       | .706  | -.297 | .092  |
| The growth rate of operating revenue (X10) | .878 | -.084 | .184 |

Extraction method: principal component analysis.
Rotation method: Caesar normalization maximum variance method.

a. Rotation converged after iteration 5

It can be seen from the component matrix that each variable is represented by a factor:

\[
\begin{align*}
X_1 &= 0.080F_1 + 0.148F_2 + 0.906F_3 \\
X_2 &= 0.359F_1 - 0.172F_2 + 0.866F_3 \\
X_3 &= 0.845F_1 + 0.138F_2 + 0.384F_3 \\
X_4 &= -0.133F_1 + 0.958F_2 - 0.043F_3 \\
X_5 &= -0.132F_1 + 0.958F_2 - 0.043F_3
\end{align*}
\]
X6=-0.266F1-0.926F2+0.071F3  \hspace{1cm} (6)
X7=0.849F1+0.214F2+0.276F3  \hspace{1cm} (7)
X8=0.398F1+0.168F2+0.780F3  \hspace{1cm} (8)
X9=0.706F1-0.297F2+0.092F3  \hspace{1cm} (9)
X10=0.878F1-0.084F2+0.184F3  \hspace{1cm} (10)

Using table 6, the scores of each factor can be calculated as follows:
\begin{align*}
F1 & = -0.208X1+0.359X2-0.070X3+0.274X4-0.069X5-0.069X6-0.119X7+0.304X8-0.037X9+0.348X10 \hspace{1cm} (11) \\
F2 & = -0.012X1-0.028X2+0.047X3+0.331X4+0.331X5-0.310X6+0.068X7+0.085X8-0.113X9-0.040X10 \hspace{1cm} (12) \\
F3 & = 0.493X1+0.392X2-0.003X3+0.055X4+0.055X5+0.071X6-0.063X7+0.348X8-0.153X9-0.137X10 \hspace{1cm} (13)
\end{align*}

The formula is used to calculate the factor comprehensive score expression as follows:
\begin{align*}
F & = 3.104/8.49 \cdot F1 + 2.932/8.49 F2 + 2.454/8.49 \cdot F3 = 36.6\% \hspace{1cm} (14) \\
F1 + 34.5\% \cdot F2 + 28.9\% \cdot F3 & = 36.6\% \hspace{1cm} (15)
\end{align*}

Table 5. Component score coefficient matrix

| Component score coefficient matrix |
|-----------------------------------|
| Component                        | 1     | 2     | 3     |
|-----------------------------------|-------|-------|-------|
| Gross profit margin (X1)          | -.208 | -.012 | .493  |
| Return on total assets (X2)       | -.070 | -.028 | .392  |
| Return on net assets(X3)          | .274  | .047  | -.003 |
| Current ratio(X4)                 | -.069 | .331  | .055  |
| Quick ratio(X5)                   | -.069 | .331  | .055  |
| Asset liability ratio(X6)         | -.119 | -.310 | .071  |
| Total asset turnover (X7)         | .304  | .068  | -.063 |
| Accounts receivable turnover rate(X8) | -.037 | .085  | .348  |
| Net profit growth rate(X9)        | .300  | -.113 | -.153 |
| The growth rate of operating revenue (X10) | .348  | -.40  | -.137 |

Extraction method: a principal component analysis.
Rotation method: Caesar normalization maximum variance method.
Component score.

The above table shows the total operating performance scores of Dongfang wealth Information Co., Ltd. from 2007 to 2020. It can be seen from the above table that only the total score from 2007 to 2012 is positive, but it also shows a downward trend. The comprehensive score from 2013 to 2020 has been negative, indicating that its operating capacity is weak. Enterprises should take into account profitability, solvency, operating capacity and growth capacity, set an overall goal, and carry out various production and operation activities around this goal. Enterprises should also improve the level of fund management, improve the efficiency of fund use, and strictly control the expenditure of costs and expenses, so as to rationalize the level of liabilities. At the same time, enterprises should also broaden business channels, strengthen diversified development of business scope, plan long-term development plans, and carry out various production and operation of enterprises from the perspective of long-term plans, so that enterprises can develop in the long term. Suggestions on improving the operating performance of Internet Financial Enterprises
4. Suggestions on improving the operating performance of Internet Financial Enterprises

As an emerging enterprise combining traditional financial industry and Internet technology, Internet financial enterprises should make up for their shortcomings in time and promote healthy and sustainable development. Although compared with the traditional financial industry, Internet finance makes innovative use of Internet concepts and technical means, its essence is finance. Since it is still finance in essence, Internet finance should be based on serving the real economy and people's livelihood.

Table 6. Seven comprehensive scores

| Particular year | F1       | F2       | F3       | Comprehensive score |
|-----------------|----------|----------|----------|---------------------|
| 2007            | 3.09254  | -0.03787 | -0.07587 | 1.1                 |
| 2008            | 0.63871  | 0.38191  | 0.50456  | 0.51                |
| 2009            | 0.54499  | 0.52126  | 0.65905  | 0.57                |
| 2010            | -0.56578 | 2.03567  | 0.12019  | 0.53                |
| 2011            | -0.41851 | 1.10629  | 0.30779  | 0.32                |
| 2012            | -0.45862 | 1.66035  | -0.65389 | 0.22                |
| 2013            | -0.07096 | -0.16782 | -1.42573 | -0.5                |
| 2014            | 0.4455   | -1.04461 | -0.45934 | -0.33               |
| 2015            | -0.37439 | -0.69564 | 2.65643  | 0.39                |
| 2016            | -0.4975  | -0.63107 | -0.69769 | -0.6                |
| 2017            | -0.43834 | -0.78697 | -0.99625 | -0.72               |
| 2018            | -0.47581 | -0.71225 | -0.64685 | -0.61               |
| 2019            | -0.66066 | -0.7917  | -0.04679 | -0.53               |
| 2020            | -0.76121 | -0.83754 | 0.75458  | -0.35               |

The healthy development of Internet financial enterprises should build an efficient and good internal operation mechanism. First of all, enterprises should understand the current situation of the company and have a clear plan for the future development direction of the company. In terms of operation, enterprises should effectively evaluate their risks, constantly update and timely improve the supporting systems and procedures, so as to achieve early identification, early warning and early disposal of risks, so as to ensure the stability of enterprise fund management. Secondly, in terms of enterprise development, enterprises should continue to promote the construction and improvement of the one-stop Internet financial service platform, strengthen the improvement and upgrading of the database, improve the data processing capacity of enterprises, and establish a healthy and effective Internet financial enterprise environment centred on the creation of integrity system. Finally, if enterprises want to avoid being marginalized in the fierce competition and enhance their competitiveness in the market, they must make timely adjustments to the new environment and new formats. In order to survive in the fierce market competition, enterprises should improve their innovation ability, focus on customer needs as the guide, pay attention to user feelings and experience, and develop financial products suitable for all kinds of people.

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