

# *An Analysis on Financial Ability of Listed Media Companies in the Context of Big Data*

Fei Yi

School of Management  
Wuhan University of Technology  
Wuhan, P.R.China  
2252629906@qq.com

**Abstract**—The thesis in hand analyzes the financial abilities of china listed media companies in the context of Big Data. An empirical study is conducted here by selecting 12 financial indicators as research variables; then it applies the method of principal component analysis and builds regression equations. Data collecting is based on average values generated from annual reports, from 2015 to 2018, of 91 sample listed companies in china mass media industry. Research results of this study show that the overall financial status of sample companies is optimistic, but profitability and growth ability of these companies still remain comparatively low. Finally, it suggests that: companies should be innovative in management, the internal structure of the industry should be optimized, and the value of data should be made full use to create new profit growth point.

**Keywords**—*media; big data; principal component analysis; financial ability*

## I. INTRODUCTION

China's media industry is developing rapidly, showing a thriving and vibrant scene. The 13th Five-Year Plan of the Chinese government clearly depicts the vision that the cultural industry will become the pillar industry of the national economy by 2020. At present, this industry is being supported and developed vigorously in all parts of the country.[1] From a global perspective, the industry has seen dramatic changes in market structure and competitive environments. The era of big data brings new opportunities and challenges to the media industry. While realizing its own sustainable development, the media industry in all countries also promotes the development of other related industries. In constant conflicts and cooperation, the media industry deconstructs and constructs itself, as well as other industries, forming a diversified, multi-polar, and co-prosperous pattern.[2] Domestically, the social media, derived from the big data background, is eroding the traditional media market little by little, taking more and more shares in the profit margin of the latter. Under such circumstance, media companies are required to improve their financial abilities, which firstly requires to evaluate their financial abilities accurately.

The term, financial ability, is a very general and highly comprehensive conceptual system, which is the corner stone and determinant factor of financial performance. Different scholars have different opinions on the composition of financial ability. Jing Xin's classification represents the main

schools of Finance and properly reflects the comprehensive financial ability of an enterprise. Based on his intensive study of relevant research results at home and abroad, he put forward that the financial ability of a modern enterprise can be classified into "four abilities", namely, profitability, growth ability, solvency ability and operation ability.[3]

## II. CONSTRUCTION OF INDEX SYSTEM

When constructing the financial capability analysis index system of listed companies in the media industry, we must abide by the following three principles[4]:

1) The principle of comprehensiveness. Namely, the analysis index system must be comprehensive and objective and the selected financial indicators can reflect the overall situation of the company's production and operation as far as possible, and meet the demands of different stakeholders.

2) The principle of operability. Namely, the financial capability analysis system must be able to be applied to practice and solve practical problems. When we are selecting indicators, redundant indicators should be removed and key indicators should not be selected which is not inadvisable to have too many indicators.

3) The systematic principle. Integrity must be considered in the principle when we are selecting individual indicators. Generally speaking, the following two aspects should be considered: the rationality of each indicator in the evaluation system and the importance of each indicator in the process of analyzing the realization of objectives.

Based on the above three principles and combining the discussion in the "Introduction" , the study in hand has set up an assessment system including twelve financial indicators, which can be divided into four categories: profitability, development ability, solvency and operating ability. In specific, indicators of profitability includes: rate of return on total assets, return on net assets, and operating profit margin; the development ability measures: growth rate of return on net assets and growth rate of net profit; while solvency category is measured by current ratio, cash ratio, asset-liability ratio and operating ability includes receivables turnover, inventory turnover, current assets turnover and total assets turnover. [5] (see Table I)

TABLE I. INDEX SYSTEM

Primary index	Secondary index	Computational formula
Profitability	Rate of return on total assets	Total net profit / average assets
	Return on net assets	After-tax profit / net assets
	Operating profit margin	Business profit / total business income
Development ability	Growth rate of return on net assets	(current net profit yields-prior-period net profit yields) / prior-period net profit yields
	Growth rate of net profit	(current net profit-prior-period net profit) / prior-period net profit
Solvency category	Current ratio	Current assets/current liabilities
	Cash ratio	Monetary funds/current liabilities
	Asset-liability ratio	Total liabilities/total assets
Operating ability	Receivables turnover	The average balance of operating income / accounts receivable
	Inventory turnover	Operating cost/average inventory balance
	Current assets turnover	Operating income / average balance of current assets
	Total assets turnover	Average operating income / total assets balance

III. DATA COLLECTION AND RESEARCH METHODOLOGY

In this study, 91 media companies listed in Hushen Stock Exchange are chosen to build a component analysis model; financial data is cited or derived from their annual reports from 2015 to 2018, which are recorded in China Stock Market & Accounting Research (CSMAR) Database. Companies with their stocks labeled as “special treatment(ST)” or “particular transfer(PT)” and companies that are listed in stock markets less than two years are excluded. Data of companies with their stocks labeled as “special treatment(ST)” or “particular transfer(PT)” is excluded because they have had a deficit for 3 years in a row, or other abnormal financial problems. Such data will affect the accuracy of this study. It is likely for these companies that are listed in stock markets less than two years to technically beautify their performance in a short period, so as to go public successfully. Such data might be biased. As described earlier, twelve financial indicators are cited or deprived of recorded data: rate of return on total assets, return on net assets, operating profit margin, growth rate of return on net assets, growth rate of net profit, current ratio, cash ratio, asset-liability ratio, receivables turnover, inventory turnover, current assets turnover and total assets turnover. The research method is using Excel as tool for primary data processing and SPSS for principal component analysis.

IV. RESULTS OF PRINCIPAL COMPONENT ANALYSIS

TABLE II. KMO AND BARTLETT’S TEST

	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.610
Bartlett's Test of Sphericity	Approx. Chi-Square	980.778
	df	66
	Sig.	.000

The tool, SPSS, is applied here to standardize 12 financial indicators of each sample company. After processing data on 91 listed companies, the results of their correlation test are shown in Table 2. KMO and Bartlett tests are used to preliminarily determine whether the quoted data is suitable for principal component analysis. When the square sum of simple correlation coefficients among all variables is much larger than the square sum of partial correlation coefficients, the KMO value approaches 1, which means that the correlation between variables is stronger and the original variables are more suitable for principal component analysis. The statistics of Bartlett test are obtained from the determinant of the correlation coefficient matrix. If the value is large, it is considered that there is a correlation between the original variables, which is suitable for principal component analysis.[6] The KMO value in Table 1 is 0.610, which is greater than 0.5. And the significance Sig of Bartlett test is far less than 0.05, which is acceptable.

TABLE III. TOTAL VARIANCE EXPLAINED

Initial Eigenvalues				Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
C	T	% of V	Cum%	Total	& of V	Cum%	Total	% of V	Cum%
1	3.4	28.00	28.00	3.36	28.0	28.0	2.71	22.55	22.55
2	2.9	24.01	52.01	2.88	24.0	52.0	2.42	20.19	42.73
3	1.9	15.74	67.74	1.89	15.7	67.7	2.39	19.88	62.61
4	1.2	10.31	78.06	1.24	10.3	78.1	1.85	15.44	78.06
5	.96	8.126	86.18						
6	.63	5.264	91.45						
7	.43	3.614	95.06						
8	.29	2.402	97.46						
9	.16	1.332	98.79						
0	.08	.625	99.42						
1	.06	.518	99.94						
2	.01	.064	100.0						

Extraction Method: Principal Component Analysis.

As principal component analysis is used here, four principal components in Table 3 with characteristic roots greater than 1

are extracted. The variance contribution rate of the first principal component is 28.00%; the second, 24.01%; the third,

15.74%; and the forth, 10.31%.The subtotal of the four components is 78.06%, which is much greater than 60%, showing that the degree of information loss after extracting the common factors is acceptable. That is to say they can accurately describe the financial ability of sample companies in the media industry.

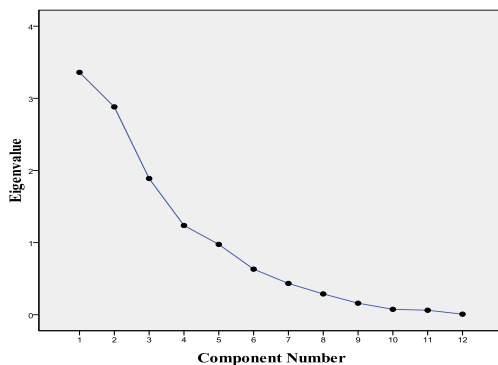


Fig.1 Scree Plot

A scree plot displays the proportion of the total variation in a dataset that is explained by each of the components in a principle component analysis. Those components on the curve with greater slope are considered to represent the vast majority of the information of the original variables. The slope of the first four components in Fig. 1 is steeper and from the fifth one, the slope of the curve gradually decreases and eventually tends to be flat. Therefore, it can be suggested that the first four ones are sufficient to accurately summarise the financial ability of sample companies.

The eigenvectors corresponding to the first four principal components in Table 3 are selected to form a matrix according to the eigenvalues among them. This matrix can observe the variables most closely related to the common factors. However, in order to more clearly display the common factors represented by each variable, the maximum variance method is used and the load matrix is rotated, as shown in Table IV.

TABLE IV. ROTATED COMPONENT MATRIX

	Component			
	1	2	3	4
Rate of return on total assets	.959	.082	-.021	.083
Return on net assets	.926	.099	.027	.015
Operating profit margin	.850	.023	.076	-.021
Receivables turnover	-.137	.894	-.046	.178
Inventory turnover	.024	.024	.051	.285
Current assets turnover	-.029	.121	-.322	.871
Total assets turnover	.025	.113	-.184	.915
Current ratio	.049	.026	.975	-.032
Cash ratio	.037	.013	.982	-.044
Asset-liability ratio	.002	.229	-.564	.347
Growth rate of return on net assets	.414	.778	-.012	.016
Growth rate of net profit	.096	.958	-.054	.115

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

The proportion of each variable shows the explanatory power and varying amount of the four principal components. The above four principal components exactly reflect the four representative indicators of sample companies. The first

principal component, F1, takes considerably large loads on asset-liability ratio (49.6%), return on net assets (92.6%) and operating profit margin (85.0%), thus reflecting the profitability of the company ; the second principal component, F2, has larger loads on the growth rate of return on net assets (77.8%) and growth rate of net profit (95.8%), reflecting the company's development ability; the third principal component, F3, accounts for larger loads on current ratio (97.5%) and cash ratio (98.2%), reflecting the solvency of the company; the fourth principal component, F4, takes large loads on receivables turnover (17.8%), inventory turnover (28.5%), current assets turnover(87.1%) and total assets turnover(91.5%), reflecting the company's operating ability.

TABLE V. COMPONENT SCORE COEFFICIENT MATRIX

	Component			
	1	2	3	4
Rate of return on total assets	.364	-.050	-.027	.036
Return on net assets	.348	-.030	-.015	-.002
Operating profit margin	.324	-.053	.004	-.005
Receivables turnover	-.123	.400	.026	-.015
Inventory turnover	.005	-.030	.077	.193
Current assets turnover	-.013	-.066	.009	.494
Total assets turnover	.004	-.078	.081	.550
Current ratio	-.016	.024	.459	.155
Cash ratio	-.020	.021	.460	.150
Asset-liability ratio	.001	.052	-.203	.092
Growth rate of return on net assets	.098	.325	-.008	-.100
Growth rate of net profit	-.038	.420	.003	-.067

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.  
Component Scores

According to the score coefficient matrix of principal components shown in table V, the four factors are expressed as linear combinations of the 12 variables, and the formulas are as follows:

$$F_1=0.364X_1+0.348X_2+0.324X_3-0.123X_4+0.005X_5-0.013X_6+0.004X_7-0.016X_8-0.020X_9+0.001X_{10}+0.098X_{11}-0.038X_{12}$$

$$F_2=-0.050X_1-0.030X_2-0.053X_3+0.400X_4-0.030X_5-0.066X_6-0.078X_7+0.024X_8+0.021X_9+0.052X_{10}+0.325X_{11}+0.420X_{12}$$

$$F_3=-0.027X_1-0.015X_2+0.004X_3+0.026X_4+0.077X_5+0.009X_6+0.081X_7+0.459X_8+0.460X_9-0.203X_{10}-0.008X_{11}+0.003X_{12}$$

$$F_4=0.036X_1-0.002X_2-0.005X_3-0.015X_4+0.193X_5+0.494X_6+0.550X_7+0.155X_8+0.150X_9+0.092X_{10}-0.100X_{11}-0.067X_{12}$$

According to the above four formulas, the principal component scores of sample companies are calculated respectively in terms of profitability, development ability, solvency and operating ability from 2015 to 2018. Then, the average scores of each component are calculated with the formula below:

$$Y=(0.22547F_1+0.20186F_2+0.19879F_3+0.15443F_4)/0.78055$$

TABLE VI. SUMMARY OF FACTOR SCORES

Name	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>	Y
Zhidu shares	2455.15	-14731	37820	94791	25286
Zhonggong education	116.341	-720.63	2459.2	6118.32	1684.1
Ziguangxueda	64.8587	-422.01	1143.7	2862.32	767.17
Yinli media	66.2557	-400.12	1035.4	2592.6	692.31
Sg group	28.0969	-171.85	437.24	1094.73	291.62
Shendatong	-1.7731	-45.664	244.18	593.767	167.34
Xy culture	10.2389	-64.277	171.95	418.88	113.00
Fuchun shares	4.20069	-25.548	69.2	171.075	46.077
Fenzhong media	2.59238	-14.66	43.97	105.81	29.090
Kaiying network	1.4590	-10.081	31.582	73.7799	20.455
Sanwu internet	-3.456	-23.189	31.976	81.3855	17.250
Qinghai spring	-1.9934	5.8845	26.602	8.9807	9.4978
Haobai shares	-0.4192	-1.5536	14.077	28.6718	8.7349
Meijimu	-1.6077	3.5966	20.71	7.09303	7.143
Blue cursor	0.1378	-2.915	9.53	23.2472	6.312
Gh shares	-7.5574	24.183	5.004	3.86081	6.1094
Zheshu culture	-0.853	2.593	9.415	16.5526	6.0967
Bw technology	-0.7371	-4.50	12.548	20.5272	5.8802
Huace film	2.72237	20.63	1.7886	-3.5279	5.8795
Wanda film	-1.4543	3.528	5.3676	12.159	4.2649

The scores of principal component analysis are summarized and 91 listed companies are ranked according to their comprehensive scores, which are analyzed by descriptive statistics (Table VI). Table V shows the scores of the top 20 listed companies with comprehensive scores. Overall: Of the 91 listed media companies selected in this paper, there are 81 listed companies scoring more than zero, indicating that their financial performance abilities are better, accounting for 89.01%. However, there are obvious differences in profitability, development ability, solvency and operation ability among listed companies. On the premise of standardization, the difference between the maximum and minimum values of the four principal components is greater than 9.

TABLE VII. DESCRIPTIVE STATISTICS

	N	Minimum	Maximum	Mean	Std.Deviation
F1	91	-.14228	9.41646	.0000000	1.0000000
F2	91	-9.41564	.13365	.0000000	1.0000000
F3	91	-.12106	9.40684	.0000000	1.0000000
F4	91	-.12107	9.40710	.0000000	1.0000000
Y	91	-.12299	9.40581	.0000000	1.0000000

Comparing the four main components, it is found that the solvency and managing ability of listed media companies are generally better, but the profitability and development capacity are generally poor, among which the development capacity is the worst. The top 20 listed companies with comprehensive scores scored more than zero in terms of solvency and only one company, Huace Film and Television, scored less than zero in terms of the managing ability. However, in terms of profitability and development capacity, there are only eleven companies and six companies scoring more than zero.

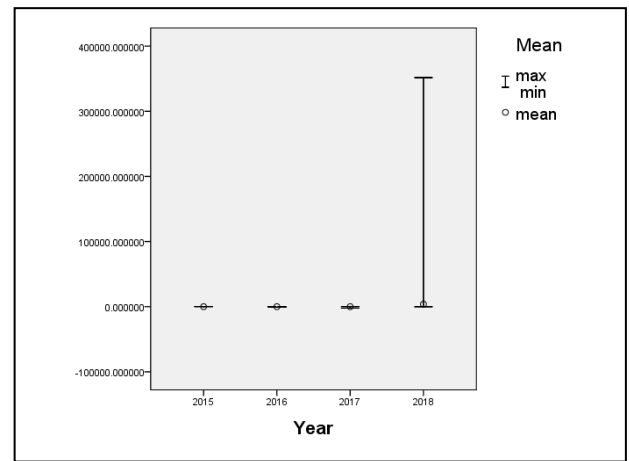


Fig.2 Profitability

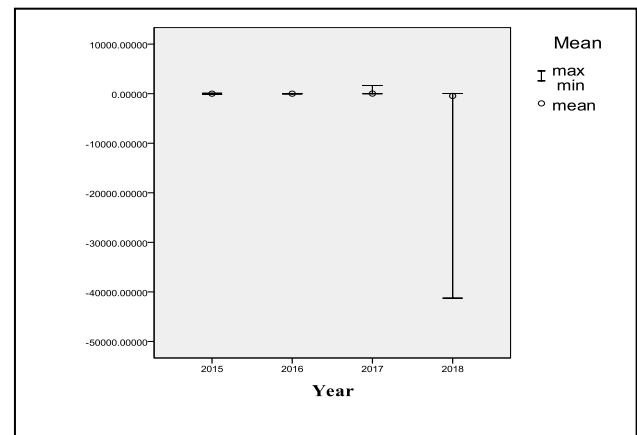


Fig.3 Development ability

The profitability and development capacity scores of 91 listed media companies in the four years from 2015 to 2018 were calculated and the high- low chart (Fig. 3 and 4) were plotted. The analysis shows that the profitability and development capacity of Listed Companies from 2015 to 2017 are relatively stable, but the overall level is not high, whose average value is close to 0. In 2018, the profitability and development capacity scores of listed companies are extremely high and low respectively. But the overall level remains unchanged, which is close to 0.

V. CONCLUSION AND SUGGESTION

From the perspective of listed companies, the following two suggestions are put forward for their sustained and high-speed development.

Innovating and optimizing the industrial structure:

From the above analysis, it can be seen that under the background of big data, the level of growth ability of listed media companies is far from encouraging. Traditional media tends to be single-structured, which draws a few attentions from the public. In the era of big data, new technologies, such as data analysis, data statistics and so on, together with more and more sophisticated internet technology, are imposing a

great impact on the media industry. [7] The emerging social media, derived from the above technologies, is challenging the authority of the media industry. Facing the threat, the media industry should make reasonable development plan. It needs to make innovations in its management mode, to optimize the internal structure of the industry, to form a solid management framework, and to realize diversified service mode on the basis of ensuring its own positioning, and thus to take a road of industrial development with Chinese characteristics.

Creating new profit growth points:

The results of the principal component analysis in this study show that the profitability of sample companies is generally poor in the context of big data. With the development of social network information technology, social media has been widely used, and many types of information and data have been generated. E-commerce companies successfully use this information and data to expand their marketing channels and gradually penetrate the media industry, which divides the profit space of the latter.[8] In this situation, the media companies may use their own advantages to further excavate and analyze the massive data; then, they can rationally pack the most valuable information and properly use it in their operation. Besides, they can create a new profit growth point either by selling the data, or by franchising other companies to use it, so as to help the industry develop at a high speed.

## REFERENCES

- [1] U. Sivarajah, Z. Irani, S. Gupta and K. Mahroof, "Role of big data and social media analytics for business to business sustainability: A participatory web context," *Industrial Marketing Management*, 2019.
- [2] Q.F. Shang, "Analysis on the Government Regulation of Foreign Media Industry," *China International Finance*, vol. (01), pp. 24-28, 2017.
- [3] J.L. Jimenez-Marquez, I. Gonzalez-Carrasco, J.L. Lopez-Cuadrado and B. Ruiz-Mezcua, "Towards a big data framework for analyzing social media content," *International Journal of Information Management*, vol. 44, 2019.
- [4] J.M. Li, "An Empirical Study on the Capacity for Sustainable Growth of Publishing Media Enterprises," *Chinese urban economy*, vol. (18), pp. 101-102, 2011. (In Chinese)
- [5] J.M. Li, Y.J. Han, "Research on the Impact of Financial Capacity on Capital Structure of Enterprises in Media Industry," *Financial Communications*, vol. (15), pp. 108-110, 2017.
- [6] J.P. Wang, N. Wang, "Financial Risk Evaluation of Energy Listed Companies in China: Based on Principal Component Analysis," *Friends of Accounting*, vol. (11), pp. 60-66, 2016. (In Chinese)
- [7] S. Majid, C. Lopez, P. Megicks and W.M. Lim, "Developing effective social media messages: Insights from an exploratory study of industry experts," *Psychology & Marketing*, vol. 36(6), 2019.
- [8] J. Wang, "Analysis on the Development Dilemma and Trend of Traditional Media and New Media in the Age of Big Data," *Intelligence*, vol. (12), pp. 239, 2018. (In Chinese)