

Industrialization leading enterprise competitiveness evaluation—— Factor analysis based on financial perspective

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Abstract

leading enterprises as the most innovative and dynamic agricultural new business entities, the effect of whose development is related to the increasing efficiency of agriculture and the increase of farmers. However, the study found that our leading enterprises are generally low in efficiency or performance and the factors that restrict its development stand out. Therefore, this paper is based on the financial data of leading enterprises in Shandong province in 2014 and 2015. By using factor analysis, 20 index variables that reflect the business performance of enterprises are reduced and treated. The performance of leading enterprises was evaluated comprehensively by the extraction of public factors. Based on this, the ranking of 394 leading enterprises in Shandong province was ranked. It is found that the total score of the leading enterprises, which accounted for 58.63% of the total samples was negative. It is showed that most leading enterprises have poor business operation. The overall score was distributed between -0.25 and 0.25. It showed that the management level of leading enterprises in Shandong province was balanced, which were at the same level.

Keywords

leading enterprises; performance evaluation; factor analysis.

1. Introduction

The development of leading enterprises is an important hand in the development of China's agricultural industrialization. Our government attaches great importance to the development of leading enterprises and provide policy and financial support by assessing leading enterprises at different levels. By the end of 2015, the total number of agricultural industrialization organizations in China reached 386,000 and over 126 million households have got benefit from it. (The data came from agriculture industrialization office of agriculture ministry). Shandong province is an important agricultural production and processing base in China whose leading enterprises are leading the country in development. Shandong agricultural hall attaches great importance to the development of leading enterprises and conduct the evaluation of leading enterprises in the province every two years to monitor the development of leading enterprises. According to the latest monitoring situation, there were 1,158 enterprises in Shandong province by the end of 2015. While monitoring the leading enterprises in the whole province, we also need innovative research perspectives and methods to evaluate the business performance of leading enterprises. Therefore, this paper is based on the financial data of leading enterprises in Shandong province in 2014 and 2015. We try to use factor analysis method to evaluate the operation performance of leading enterprises and rank them according to the factor comprehensive score.

In recent years, scholars have studied the development of leading enterprises in many angles. The results are as follows: Li yanqiong and Zhang xurui (2009) put forward the problem of cultivating competitiveness of leading enterprises from the perspective of value chain¹. Wan lun et al. (2010) studied the effect of the three industrialization modes on the technological efficiency of the leading enterprises, including the company + professional cooperative organization + base + farmers' company + base + farmers and company + farmers². Zhang min et al.(2011)puts forward the achievements and problems of developing agricultural industrialization in China by combing through

the experience of the development of agricultural industrialization in developed countries³. Jia wei and Qin fu (2013) established a regression model and pointed out that the R&D investment and technical efficiency of the total labor assets had a significant impact on the performance of agricultural enterprises⁴. Longdong equality (2014) empirically analyzes the location selection problem of the leading enterprise cluster development⁵. Xu fangyuan (2015) has studied the rules and patterns of capital operation of agricultural enterprises through the perspective of hypercycle theory⁶.

In addition, the scholars also have more empirical tests on the performance and competitiveness of leading enterprises. Yuan bin et al. (2015) used the DEA model to analyze the output performance of leading enterprises in different grades in Nanjing. Zhu Mingli and Wang Huaiming (2004) analyzed the operation performance of 46 agricultural listed companies by using factor analysis⁷. Wang aiquan et al. (2009) constructed the competitive evaluation system of leading enterprises by using principal component analysis, and ranked the competitiveness of 76 leading enterprises in Jilin province⁸.

Through the above analysis, we find that the empirical tests tend to be listed enterprises, and in fact, most enterprises do not have the listing conditions and qualifications. Therefore, the conclusion that taking listed enterprises as research samples may not be suitable for many leading enterprises. So we collected and sorted out the financial statement data of leading enterprises in Shandong province and the business conditions of the sample enterprises would be evaluated scientifically. This paper constructs a leading enterprise index evaluation system from four aspects: profitability capacity and asset management ability based on domestic and foreign research. The financial data of 394 leading enterprises in 17 cities of Shandong province were analyzed quantitatively, and the operation performance and competitiveness of the leading enterprises were discussed in depth by the factor analysis method.

2. Factor analysis model and index construction

2.1 Construction of financial indicators

This paper selects 20 financial indicators from the four aspects of profitability and asset management ability of enterprises based on the principle of comprehensively reflecting the operation effect of leading enterprises. The main business profit margin ratio of net asset return total assets profit margin and surplus cash guarantee multiple represent the profit side of enterprise operation effect. The five indicators are all positive indicators. The greater the value, the stronger the profitability. The current ratio, the quick ratio and the ratio of assets to liabilities represent the solvency of the enterprise, and the three indicators are the indicators of fitness. Total assets growth rate, MBRG, net profit growth rate, net capital increasing ratio and main business profit growth rate represent the growth of enterprise capability. All the five indicators are positive indicators, and the larger the value, the stronger the enterprise grows. Enterprise asset management capabilities can be represented with seven indicators such as inventory turnover ratio, turnover of account receivable ratio and so on. They are all positive or appropriate indicators.

The code and computing method of 20 indicators are as table 1. Some indicators are taken the average treatment. The mean value = (initial value of 2015 + last value of 2015) / 2; The growth rate = (index value of 2015 - index value of 2014) / index value of 2014

Table 1. The competitiveness evaluation index system of leading enterprises in Shandong province of 2015

index classification	variable name	variable code	formula mode
profitability	main business profitability	P1	income from main operation / net business revenue
	net assets income rate	P2	net profit / mean value of the owner's equity
	return on total assets	P3	net profit / mean value of assets
	profit rate of asset	P4	total profit / mean value of assets
	surplus cash guarantee multiple	P5	net cash flow in annual operation / net profit
debt paying ability	liquidity ratio	D1	total current assets / mean value of total current liabilities
	quick assets ratio	D2	liquid assets / mean value of liquid total assets
	debt-to-assets ratio	D3	total liabilities / mean value of assets
growth ability	total assets growth rate	G1	total assets growth / total assets of last year
	MBRG	G2	Main business revenue growth / last year main business income
	net profit growth rate	G3	Net profit growth /the net profit of last year
	net assets growth rate	G4	growth of net assets / net asset of last year
	main business profit growth rate	G5	main business profit growth / main profit of last year
capacities of assets management	inventory turnover	A1	operating income / average inventory balance
	accounts receivable turnover rate	A2	sales revenue / mean value of average receivables
	turnover of fixed assets	A3	operation revenue / fixed assets-net value
	velocity of liquid assets	A4	main business income / total amount of current assets
	total assets turnover	A5	main business income / mean value of assets
	cash recovery for assets	A6	net cash flow in annual operation / mean value of assets
	cash flows coverage ratio	A7	net annual operating cash flow / the mean of total current liabilities

2.2 Factor analysis model and step

The basic principle of factor analysis is to combine multiple variables of a certain relationship into a few factors. This method can be used to evaluate the performance and competitiveness of enterprises. This can be seen in the paper of Wen Wei and Zheng Minggui(2015)⁹. Based on factor analysis, the financial performance of Chinese steel listed companies is analyzed, and the operation performance of pharmaceutical listed companies in China is analyzed by using factor analysis method by Tao Chunhai(2012)¹⁰. Fang Xianming et al. (2014) used factor analysis to evaluate the competitiveness of 16 listed commercial Banks. Therefore, this paper tries to use the method of factor analysis to evaluate the operation performance of leading enterprises, and finally rank the leading enterprises' competitiveness according to the comprehensive score.

In the factor analysis model, the original variables are composed of a common factor F_i and a unique factor. Let's assume there are m enterprises and n indicator variables. The indicator variables are L_1, L_2, \dots, L_n and the common factors are $F_1, F_2, \dots, F_p (p < n)$. The basic form is as follows:

$$\begin{cases} L_1 = a_{11}F_1 + a_{12}F_2 + \dots + a_{1p}F_p + \varepsilon_1 \\ L_2 = a_{21}F_1 + a_{22}F_2 + \dots + a_{2p}F_p + \varepsilon_2 \\ \dots\dots\dots \\ L_n = a_{n1}F_1 + a_{n2}F_2 + \dots + a_{np}F_p + \varepsilon_n \end{cases} \quad (1)$$

This paper uses factor analysis to evaluate the performance of enterprises in the following steps.

1. Firstly, we standardized and normalized the variables of 20 financial indicators to ensure the unity of the dimensions of the indicator variables. All the indicators in this paper are positive and fitness indicators, so there is no need for positive treatment. The original index variable data was standardized by z-score normalization method. The standardized value= (original value- mean value)/ standard deviation.
2. The correlation test of the index variables was carried out to test the KMO test and Bartlett sphere test by using the STATA13.0 software and the analysis data was suitable for factor analysis method.
3. The factor analysis of 20 index variables was carried out by using principal component factor method. The researchers have verified that the rotation operation helps to further simplify the factor structure. Therefore, the factor structure was rotated and the factor loading matrix was obtained.
4. The main factor results of all samples were calculated and the factor ranking of samples was carried out. The composite score of the sample was calculated according to the contribution of the main factor. The comprehensive scoring of sample enterprises is obtained by using the formula (2).

$$F = \sum_{i=1}^p K_i F_i, K_i = \lambda_i / \sum_{j=1}^p \lambda_j \quad (2)$$

3. Empirical analysis

3.1 Data source and standardized processing

We selected sample source companies in 2016 in Shandong province agriculture industrialization office work on monitoring and evaluation of the agricultural industrialization leading enterprises, the financial data for the selected sample companies were from copies of audited financial statements to sort out. According to the need to select index variable, to study on enterprise data sorting, eliminate missing data and outliers, eventually pick up 394 from the 590 leading enterprises as the research samples in this paper.

It showed the distribution of selected samples in various cities of Shandong province in the table 2. The distribution of selected samples in the cities of Shandong province is shown in table 3. Due to the different number of leading enterprises in various cities, we selected the sample size from the local market and selects from the total number of local enterprises. The number of leading companies in the sample was the largest in Yantai. It was 42. The least number of leading companies were all 15 from Dongying, Laiwu, Zibo.

It showed the statistical description of 20 indicator variables of 394 leading companies. Because of the number of this sample was large, it was inconvenience to list the characteristics of each sample. So we reflected the characteristics of sample enterprises as a whole only from the average of the minimum maximum median and standard deviation these aspects. The 17cities of Shandong province can be represented by their license letter.

Table2 .The distribution of sample leading enterprise in 17cities of Shandong province in 2015

region	B	F	G	K	M	N	E	R	A	H	J	S	P	Q	L	D	C	Total
N	19	42	40	28	22	20	15	23	20	22	20	15	23	35	17	18	15	394

Note: N represents the number of leading enterprises, unit: home

Table3 .The financial indicators descriptive statistics of leading enterprises of Shandong province in 2015

target variable	mean value	min	max	median	standard deviation	samples
ZYLRL	14.58	1.54	97.03	12.74	9.26	394
ROE	13.32	0.30	60.68	11.95	7.94	394
ROA	8.74	0.19	54.14	7.68	5.76	394
Return on total assets	10.15	0.48	72.19	8.97	6.89	394
SSCM	118.27	-957.78	5710.70	83.60	335.67	394
Current Ratio	285.29	11.99	6481.22	184.19	485.85	394
Quick interest rates	161.46	9.12	3072.33	99.51	279.22	394
Debt Asset ratio	32.99	0.63	94.68	32.46	14.84	394
TAGR	8.78	-68.42	214.19	6.29	19.51	394
MBRG	6.19	-99.02	879.68	1.81	59.25	394
NPGR	5.09	-602.78	1544	0.94	100.07	394
NAV	24.41	-70.35	1466.99	10.55	126.16	394
Main business profit growth rate	3.78	-2880.23	579.75	1.55	152.33	394
Inventory turnover	919.97	0.38	28123.98	539.72	2061.60	394
Receivable turnover	2039.23	74.44	20674.67	1153.97	2665.21	394
FATO	482.30	23.23	10239.94	357.34	683.42	394
Current Assets Turnover	306.50	0.19	2116.96	253.09	229.82	394
TATO	148.91	6.47	824.82	129.54	93.46	394
Cash recovery for all assets	7.18	-43.84	59.74	6.26	10.22	394
Cash Flows Coverage Ratio	16.09	-180.09	263.74	12.26	28.19	394

N: The various ratio units in the table are %.

3.2 Feasibility test of factor analysis

It showed the results of STATA13.0 in the table 4. The test result of KMO was 0.602. It was acceptable because of in the intermediate critical level. The chi-square value of Bartlett was 4967.46 ($p < 0.000$). Finally, the index correlation coefficient was high by correlation test, so factor analysis can be carried out (It can be seen in the table 4)

Table4 .KMO and Bartlett

Kaiser-Meyer-Olkin measurement		0.602
Bartlett Sphericity test	The approximate chi-square	4967.46
	df	190
	Sig.	0.000

3.3 Determination of factor variables

We selected eigenvalue which was greater than 0.6 and the cumulative contribution rate is 96.01% of the 14 main factors after the processing of standardized processing data. The cumulative contribution rate of the selected factors in this paper is high, which contains most of the information of the original variables. According to the post-rotation factor loading matrix, after selecting 14 factors, the unexplained components were small which indicated that the selected factor represented a strong ability (see table 5).

Table5. The variance contribution rate and the variance accumulation contribution rate of each factor are respectively

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
Var	4.04	2.44	2.02	1.99	1.19	1.07	1	0.99	0.89	0.85	0.73	0.72	0.67	0.60
pro	14.78	9.90	9.58	7.80	6.84	6.26	5.46	5.36	5.08	5.03	5.02	5.01	5.00	4.87
cum	14.78	24.68	34.26	42.07	48.91	55.17	60.63	65.99	71.07	76.10	81.12	86.13	91.14	96.01

Note: var means eigenvalue. Pro and cum the contribution rate and the cumulative contribution rate are respectively, whose unite are %.

According to the load result of the rotating factor, we named the selected factor as follows. It is because of the factor loading large value in five indicators(P1,P2,P3,P4,P5) that we called the F1,F8 and F14 as profitability factor. We called F2,F7 as solvency factor. The growth factor represents by F9,F10,F11,F12,F13 and capacities of assets management can be represented by F3,F4,F5,F6(table6)

Table 6 .The factor loading matrix after rotation

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	
P1	0.135	0.042	0.065	-0.099	-0.062	-0.116	0.008	0.968	0.024	0.033	0.002	0.013	-0.028	-0.010	0.009
P2	0.926	-0.010	0.060	0.036	0.091	0.081	0.193	0.058	0.137	0.107	0.058	0.046	0.030	-0.083	0.038
P3	0.952	0.058	0.128	0.030	0.097	0.057	-0.170	0.045	-0.010	0.017	0.051	0.056	0.044	-0.068	0.017
P4	0.944	0.064	0.135	0.019	0.057	0.059	-0.157	0.064	-0.024	0.018	0.043	0.083	0.047	-0.024	0.038
P5	-0.138	-0.019	0.244	0.016	0.016	0.001	0.020	-0.011	-0.012	0.002	0.001	0.000	0.019	0.958	0.001
D1	0.054	0.974	0.000	-0.004	-0.033	0.014	-0.135	0.010	-0.009	-0.034	0.003	-0.006	0.001	-0.014	0.028
D2	0.036	0.984	-0.006	-0.010	0.030	0.000	-0.059	0.038	-0.011	-0.013	0.004	-0.016	0.001	-0.007	0.024
D3	-0.115	-0.198	-0.058	0.050	0.000	0.017	0.947	0.010	0.006	0.085	-0.028	0.062	-0.034	0.021	0.031
G1	0.096	-0.041	-0.007	0.017	-0.006	0.032	0.075	0.031	0.055	0.987	0.031	0.019	0.046	0.002	0.000
G2	0.104	0.007	0.000	0.050	0.077	0.030	-0.025	0.000	0.010	0.031	0.988	0.032	0.023	0.001	0.000
G3	0.131	-0.019	0.017	-0.008	-0.014	0.001	0.054	0.011	-0.005	0.019	0.033	0.985	0.044	0.000	0.005
G4	0.064	-0.018	-0.015	0.001	-0.017	-0.008	0.006	0.022	0.995	0.054	0.010	-0.005	0.012	-0.011	0.001
G5	0.082	0.002	0.046	0.028	0.004	0.026	-0.030	-0.027	0.012	0.045	0.023	0.043	0.991	0.017	0.000
A1	0.150	0.019	0.069	0.093	0.935	0.043	0.040	-0.038	-0.018	-0.004	0.077	-0.034	0.001	0.009	0.077
A2	-0.030	0.021	0.072	0.927	0.038	0.048	0.124	-0.046	0.008	0.026	0.034	-0.039	0.026	0.002	0.110
A3	0.112	0.025	-0.026	0.092	0.048	0.965	0.028	-0.093	-0.007	0.034	0.025	-0.006	0.024	-0.006	0.032
A4	0.187	-0.078	0.136	0.607	0.545	0.200	-0.203	-0.139	-0.009	-0.024	0.074	0.077	0.013	0.035	0.161
A5	0.291	-0.071	0.049	0.537	0.392	0.495	-0.095	-0.286	-0.017	0.013	0.058	0.050	0.037	0.049	0.120
A6	0.149	-0.016	0.943	0.027	0.038	0.015	-0.006	-0.018	-0.041	0.008	0.012	0.017	0.047	0.166	0.054
A7	0.144	0.011	0.942	0.092	0.066	-0.035	-0.062	0.094	0.021	-0.017	-0.011	0.006	0.012	0.108	0.053

Note: F1 of the horizontal axis to F14 indicates the main factor of extraction, and P1 to A7 on the vertical axis indicates the original financial indicator variable

3.4 Leading enterprises score and integrate scores

The coefficient value of each factor was extracted after selecting the factor and the score expression of each factor was calculated based on the expression of the factor coefficient value, and the score value of the 394 faucet was calculated according to the expression. (It can be seen in the table 7).

Each factor expression is shown below:

$$F1 = -0.064 * P1 + 0.395 * P2 + 0.380 * P3 + 0.386 * P4 + 0.088 * P5 - 0.01 * D1 - 0.021 * D2 + 0.049 * D3 - 0.052 * G1 - 0.043 * G2 - 0.072 * G3 - 0.038 * G4 - 0.036 * G5 - 0.08 * A1 - 0.007 * A2 - 0.091 * A3 - 0.045 * A4 + 0.035 * A5 - 0.054 * A6 - 0.083 * A7$$

$$F2 = -0.039 * P1 + 0.012 * P2 - 0.021 * P3 - 0.017 * P4 + 0.009 * P5 + 0.506 * D1 + 0.526 * D2 + 0.071 * D3 + 0.016 * G1 - 0.001 * G2 + 0.019 * G3 + 0.008 * G4 + 0.0002 * G5 + 0.043 * A1 + 0.048 * A2 + 0.012 * A3 - 0.054 * A4 - 0.033 * A5 + 0.008 * A6 + 0.007 * A7$$

$$F14 = 0.025 * P1 + 0.042 * P2 + 0.053 * P3 + 1.094 * P4 + 0.006 * P5 + 0.009 * D1 - 0.004 * D2 - 0.01 * D3 - 0.01 * G1 - 0.01 * G2 - 0.014 * G3 + 0.01 * G4 - 0.02 * G5 - 0.034 * A1 - 0.023 * A2 - 0.04 * A3 + 0.001 * A4 + 0.054 * A5 - 0.123 * A6 - 0.186 * A7$$

Table 7.Component Score Coefficient Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
P1	-0.064	-0.039	-0.053	0.116	0.088	0.158	-0.059	1.048	-0.021	-0.029	-0.012	0.013	0.028	0.025
P2	0.395	0.012	-0.060	-0.020	-0.049	-0.057	0.285	-0.061	0.065	-0.027	-0.013	-0.091	-0.021	0.042
P3	0.380	-0.021	-0.055	-0.007	-0.070	-0.079	-0.063	-0.052	-0.060	-0.038	-0.032	-0.050	-0.024	0.053
P4	0.386	-0.017	-0.064	0.000	-0.106	-0.067	-0.055	-0.035	-0.075	-0.041	-0.036	-0.025	-0.023	0.105
P5	0.088	0.009	-0.171	-0.004	-0.025	-0.024	-0.004	0.017	0.009	-0.009	-0.006	-0.013	-0.017	1.094
D1	-0.010	0.506	0.007	0.024	-0.023	0.005	0.046	-0.045	0.012	0.010	-0.002	0.022	-0.007	0.006
D2	-0.021	0.526	0.004	0.000	0.058	-0.007	0.124	-0.015	0.008	0.022	-0.005	0.009	0.004	0.009
D3	0.049	0.071	0.030	-0.002	0.045	0.005	0.936	-0.033	-0.031	-0.086	0.011	-0.019	0.021	-0.004
G1	-0.052	0.016	0.012	-0.009	0.022	-0.029	-0.111	-0.031	-0.054	1.033	-0.030	-0.001	-0.046	-0.010
G2	-0.043	-0.001	0.015	-0.035	-0.074	-0.012	0.025	-0.006	-0.008	-0.029	1.026	-0.029	-0.016	-0.010
G3	-0.072	0.019	0.000	-0.008	0.008	-0.003	-0.034	0.005	0.015	-0.005	-0.025	1.016	-0.036	-0.014
G4	-0.038	0.008	0.015	-0.009	0.021	0.014	-0.037	-0.022	0.997	-0.052	-0.008	0.018	-0.008	0.010
G5	-0.036	0.000	-0.024	-0.019	0.019	-0.014	0.032	0.036	-0.007	-0.046	-0.017	-0.039	1.019	-0.020
A1	-0.080	0.043	-0.018	-0.269	0.922	-0.096	0.113	0.074	0.013	0.015	-0.041	-0.027	0.030	-0.034
A2	-0.007	0.048	-0.033	0.826	-0.293	-0.181	0.097	0.106	-0.012	-0.011	-0.003	-0.053	0.005	-0.023
A3	-0.091	0.012	0.048	-0.178	-0.101	0.966	0.032	0.163	0.012	-0.028	0.002	-0.015	-0.004	-0.040
A4	-0.045	-0.054	-0.023	0.306	0.276	-0.035	-0.203	0.057	0.014	0.003	-0.038	0.091	-0.027	0.001
A5	0.035	-0.033	-0.047	0.203	0.084	0.243	-0.078	-0.085	-0.004	-0.002	-0.039	0.030	-0.020	0.054
A6	-0.054	0.008	0.574	-0.097	-0.046	0.046	0.072	-0.106	-0.018	0.020	0.029	-0.007	-0.004	-0.123
A7	-0.083	0.007	0.571	-0.010	-0.015	0.014	0.006	0.028	0.045	0.000	-0.003	-0.001	-0.031	-0.186

Note: F1 of the horizontal axis to F14 indicates the main factor of extraction, and P1 to A7 on the vertical axis indicates the original financial indicator variable.

Then, the composite score of the sample leading enterprises was calculated based on the comprehensive scoring formula. It was listed only the basic state of the enterprise in the top 30 for reasons of space. We found that the distribution of the top 30 companies in cities was as follows. The first one was a score of 1.295, almost four times the number of the thirtieth, and the development level of the leading companies was wide.

Table 8. The distribution of the top 30 companies in 17cities of Shandong province in 2015

region	G	K	M	E	R	A	H	J	Q	L	D	M	C	Total
N	1	3	3	1	4	3	2	4	3	2	1	2	1	30

According to the results of the overall sample enterprises, we can find that the leading enterprises have the following characteristics.

1. Among the total 394 sample leading enterprises, 163 enterprises scored positive points, accounting for 41.37 of the total samples. Because the comprehensive score shows the operating condition of the enterprise, greater than zero indicates that the operation was well.
2. From the interval distribution of the composite score of the sample leading enterprise, the number of the concentrated distribution is between -0.25 and 0.25, and it reaches 300, accounting for 76.14 of the total sample. It shows that the operating performance of the most sample leading enterprises is not large, and the operating level is at the same level (It can be seen in the figure 1 and figure 2)
3. The leading enterprises have a large gap in profitability and asset management ability according to the scores of each factor, but they are more concentrated in the overall score. It is shown that the development of the leading enterprises is not balanced. Most enterprises make up the deficiency of weak ability by improving their strong ability. Therefore, the next step, the leading enterprises need to pay attention to the aspects of their own abilities, and make up the shortcomings of their own development (table 7).

4. From the distribution of the probability density of various abilities, the sample leading enterprises show a certain positive distribution characteristics in the scores of various abilities. The scores of various ability scores were distributed at zero or so, but the kurtosis of the internal and external capabilities of various abilities was somewhat different (figure 3, fig.5 and fig.6).

Table 9. The comprehensive ranking of the leading enterprises in Shandong province in 2015

ranking	region	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	Total
1	M	4.37	1.54	6.00	3.34	-0.09	-0.71	-1.69	2.75	-0.28	-0.99	-2.22	-0.63	-0.92	-0.95	1.395
2	M	8.03	-0.37	-1.21	0.45	-1.09	0.89	-0.42	0.34	-1.01	-1.30	-0.83	4.62	3.10	1.19	1.387
3	J	1.13	-0.15	-1.26	3.14	1.92	8.10	1.52	-0.08	0.38	4.15	-0.31	1.09	-0.11	-0.11	1.302
4	K	0.33	11.72	0.66	-0.06	-0.14	-0.52	-0.22	-0.29	0.02	0.28	-0.18	0.22	-0.14	0.12	1.266
5	M	1.47	-0.05	0.59	-0.08	5.91	0.81	1.61	0.14	-0.12	0.09	7.20	0.21	-0.03	-0.26	1.217
6	A	4.14	0.34	2.09	-3.99	11.37	-2.04	1.44	0.63	-0.25	-0.54	-1.15	-1.41	-0.19	-0.37	1.148
7	J	-0.41	5.22	0.76	-0.02	0.62	0.08	2.00	4.50	0.32	0.13	0.16	0.08	0.19	0.02	1.012
8	Q	2.15	-0.09	-0.46	1.16	-0.58	-0.03	-0.26	-0.58	11.33	0.42	-0.40	0.11	-0.03	0.28	0.899
9	K	-0.70	5.76	0.09	2.95	0.60	-1.31	2.86	0.09	0.01	-0.46	-0.13	-0.31	0.20	-0.08	0.820
10	Q	-0.97	9.24	0.33	-0.17	0.26	-0.33	-0.38	-1.33	0.17	-0.08	-0.01	0.49	0.03	0.01	0.757
11	A	0.31	-0.54	0.16	0.87	-0.72	-0.08	-0.75	1.45	-0.28	-0.88	14.92	-0.45	-0.29	-0.14	0.734
12	H	-1.87	-0.21	-0.32	3.26	10.85	1.07	-0.82	-0.13	0.16	-0.20	-0.98	0.54	0.02	-0.13	0.681
13	E	-0.13	0.11	-2.23	0.14	0.81	-0.04	-0.27	0.48	0.07	-0.33	-0.11	-0.90	-0.12	17.88	0.681
14	D	-0.43	-0.40	1.82	5.37	0.88	0.56	0.99	-0.88	-0.01	0.17	-0.39	0.38	-0.14	0.35	0.636
15	C	0.60	5.09	0.34	-0.39	-0.25	-0.01	0.37	0.52	-0.02	-0.94	-0.13	0.01	0.05	0.09	0.601
16	H	1.03	-0.13	0.61	-0.47	-0.19	-0.11	-0.35	-0.62	0.39	6.20	1.97	0.69	0.36	0.02	0.597
17	R	3.81	0.24	-1.41	1.50	-0.18	3.77	-0.26	-0.99	-0.23	-2.47	-0.71	0.00	-0.29	0.58	0.591
18	J	0.21	5.50	-2.43	0.30	0.81	-0.36	2.00	-0.46	-0.22	1.40	-0.13	-0.12	0.08	-0.46	0.533
19	K	2.12	-0.05	-1.09	0.25	-0.56	-0.98	3.23	0.53	0.02	3.31	-1.14	1.25	0.17	-0.01	0.530
20	L	-1.13	1.31	0.21	-2.84	-1.55	13.98	-0.44	1.44	0.12	-0.95	-0.05	-0.13	-0.02	-0.62	0.523
21	R	2.32	-0.50	5.47	-0.61	-0.98	0.27	0.05	-0.30	-0.55	-2.34	-0.15	-0.43	-0.27	-0.59	0.509
22	G	-0.79	-0.01	1.03	6.30	-1.25	0.84	1.69	-0.10	-0.23	-0.78	-0.47	-0.46	-0.12	1.16	0.500
23	R	3.35	1.05	0.24	0.00	-0.13	-0.22	-1.58	-0.45	-0.25	1.15	-0.47	-0.53	-0.46	0.37	0.500
24	A	-2.05	-0.07	-0.31	0.13	0.36	-0.45	1.42	0.16	0.13	-0.75	-0.41	15.75	-0.22	-0.52	0.473
25	M	0.16	-0.31	-0.66	0.35	-0.01	0.10	-1.15	1.55	8.15	0.01	0.77	-0.24	0.47	0.02	0.468
26	M	3.09	-0.18	-0.47	-0.33	-0.60	0.10	0.59	-0.51	-0.28	-1.05	1.44	1.26	0.51	0.25	0.462
27	Q	0.95	-0.45	2.44	-0.43	-0.27	-0.44	-0.69	0.73	0.21	1.37	0.15	0.80	0.91	-0.21	0.433
28	L	2.42	-0.40	-0.39	0.40	-0.74	-0.57	1.11	0.76	-0.06	1.11	-0.12	0.27	-0.02	0.19	0.411
29	J	1.38	0.03	0.94	-0.17	0.10	0.00	-0.10	1.83	-0.11	0.42	-0.92	0.05	-0.02	0.08	0.373
30	R	2.17	1.01	-0.33	1.69	-1.07	-0.43	-1.41	-0.09	-0.33	0.80	-0.20	-0.27	-0.15	0.20	0.356

Note: Only the leading enterprises in the top 30 comprehensive scoring rankings are limited to the non-public nature of enterprise data for reasons of space. Therefore, this paper only gives the region and ranking of the enterprises.

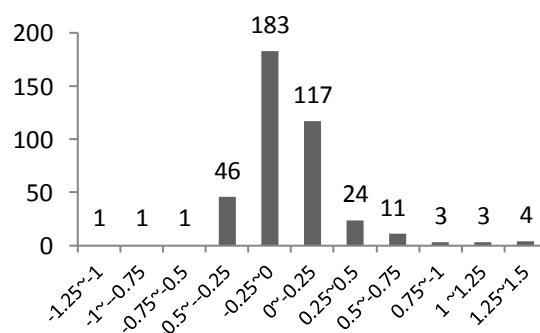


chart1. Integrated efficiency interval distribution of the leading enterprise in Shandong province in 2015

Table 7. Statistical descriptions of factors and comprehensive scores of the leading enterprise in Shandong province in 2015

	F1	F8	F14	F2	F7	F9	F10	F11	F12	F13	F3	F4	F5	F6	F
N	394	394	394	394	394	394	394	394	394	394	394	394	394	394	394
MAX	8.03	9.41	17.88	11.72	4.90	11.33	11.01	14.92	15.75	3.10	6.00	6.30	11.37	13.98	1.40
MIN	-2.05	-1.33	-2.39	-0.69	-2.15	-1.01	-3.84	-2.22	-6.14	-18.97	-6.18	-3.99	-2.10	-2.04	-1.05
MED	-0.15	-0.20	-0.08	-0.20	-0.08	-0.10	-0.09	-0.06	-0.04	0.04	-0.08	-0.26	-0.14	-0.18	-0.05

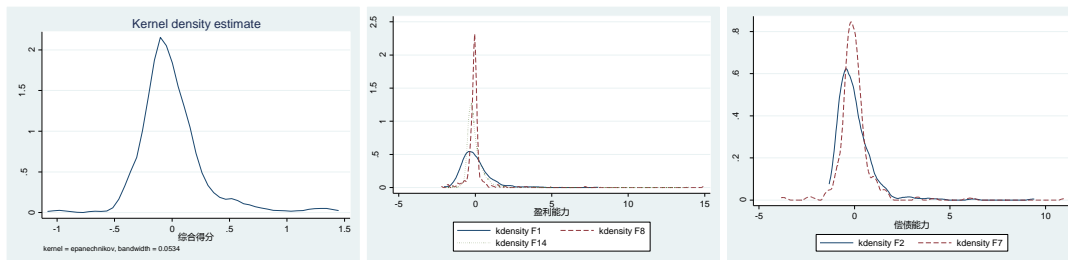


chart2 Comprehensive scoring probability chart3 Profitability probability density chart4 Probability density

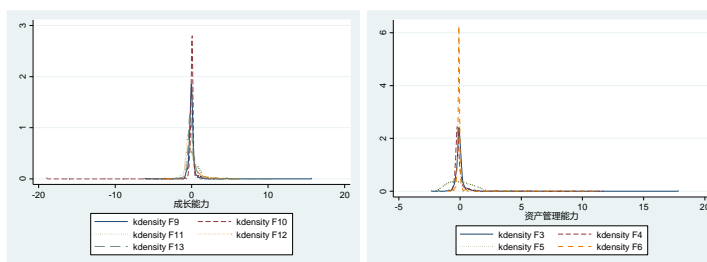


Chart 5. Growth capacity probability density chart6 Probability density of asset management ability

4. Conclusions and recommendations

It showed that 394 leading enterprises in Shandong province have scored in the ability of earning ability ,asset management and comprehensive performance through the empirical analysis. It was found that the comprehensive performance of leading enterprises in Shandong province was at a low level, and the development of various abilities was not balanced. Therefore, in view of the development status of leading enterprises in shandong province, we propose the following suggestions.

Firstly, the leading enterprises should pay attention to the comprehensive balanced development of all abilities, especially the improvement of the ability of low scoring factors. In terms of profitability, the main task is to increase the profit of the enterprise and improve the profit margin by increasing the management to reduce the cost expense and enlarge the scale of enterprise scale. In the respect of debt paying ability, due to the different business model, and the characteristics of the product, the leading enterprises should be under the reasonable debt levels and improve the service efficiency of funds and profits by keeping current ratio and quick rate in appropriate range. In terms of the growth capacity, the research has found that the leading enterprises are mostly in the increasing phase of scale compensation. Therefore, the leading enterprises should pay attention to the expansion of scale, strengthen the relationship with the interests of farmers, focus on the construction of products and brands, and expand the scope of the sales area of enterprises. In terms of asset management ability, the leading enterprises should focus on improving the efficiency of fixed asset investment, maintain reasonable turnover rate, strengthen the contact and relationship construction with customers, and reduce the non-performing loan ratio.

Secondly, our government should strengthen the support of leading enterprises and improve the supporting effect. The banking system should strengthen financial credit support for leading companies and ease lending restrictions appropriately. Then innovative the raise financing methods of leading enterprises ,expand direct financing channels and establish a leading enterprise development fund and support the steady development of leading enterprises. Lastly, we shouldl develop a favorable external environment for leading enterprises and strengthen technical and financial support for leading enterprises.

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