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Financial Performance Evaluation of Express Delivery Companies Based on Factor Analysis

-- Take SF Express as an example

Tao Qi, Xiao Chang*

College of Statistics and Applied Mathematics, Anhui University of Finance and Economics Bengbu Anhui, 233030, China
*Corresponding author: Changxiao (Email: chxlaugh@163.com)

Abstract: In recent years, the rapid development of e-commerce has driven the express delivery industry. 100 billion is no longer an unattainable peak. Despite the impact of the epidemic, the express delivery business volume still exceeded 100 billion in 2022, reaching 110.58 billion. This paper takes the representative SF Express company in China as the reference object and collects financial data from 2014-2022. Two representative indicators were selected from each of the four major capabilities of financial performance, namely operation capability, profitability capability, development capability and debt paying capability. The statistical software SPSS26.0 was used to score the collected financial indicators comprehensively by factor analysis method, and apply knowledge the score function of SF Express's financial performance analysis was calculated. The comprehensive score of operation factor, profit factor and development factor is obtained, and some suggestions are put forward for the problems in its analysis. Simple and reasonable analysis, draw some conclusions.

Keywords: Express company, Financial performance, Factor analysis.

1. Introduction

1.1. Research background

With the development of social economy and e-commerce, express logistics industry plays a very important role in people's lives, and many residents are increasingly dependent on express delivery. Whether online or offline, or shop owners, resident consumers are using express logistics. Consumers' demand for express delivery has been increasing, but consumers have different feelings about the experience of express service, some express service companies are better, some are worse(Li Xiaohong 2023[1]). This paper selects SF Express, which enjoys a good reputation among consumers. Founded in Shunde, Guangdong Province in 1993, SF Express has become one of the top two companies in China after years of hard development. The company's main business is procurement, production, distribution, sales, after-sales integrated supply chain solutions. At the same time, it also has an intelligent logistics operator "sky network + ground network + information network" with network scale advantages over other companies. Sf Express provides humanized services to meet customer needs and improve people's quality of life. However, according to the statements of SF Express in recent years, it is not very optimistic in business dealings, some funds are difficult to recover, and bad debts may be disposed of, resulting in slow capital flow, low gross profit rate and pressure to repay debts [2-5]. Therefore, it can be seen that the financial diagnosis and financial performance analysis of the company find problems, put forward problems and provide a reference basis for solving problems.

1.2. Research methods

With the development of economy and science and technology, the prosperity of new retail and e-commerce, the service quality required by residents has also improved, which makes the performance evaluation of companies appear errors and the difficulty increases. The increase of variables makes some traditional financial performance evaluation no longer used, because most of the traditional financial performance evaluation can only handle a small amount of data, when the data is too much, it will be too one-sided and difficult. Therefore, this paper adopts a different performance evaluation method, factor analysis, which is used to determine the underlying factor structure between a set of observed variables. Factor analysis was first discovered by Karl Pearson, Charles Spearmen and others. Yang Ke [4] conducted a test on intelligence, and the results were obtained through statistical analysis to reduce the dimension of variables without losing information. It can help us understand the relationships between observed variables and reduce them to fewer potential factors, and it allows us to simplify complex data. Compared with the traditional factor analysis method, it can consider multiple indicators or factors comprehensively, so as to evaluate the performance more comprehensively. Moreover, there is a unique dimensionality reduction system, which allows a small number of factors to represent the information that many variables want to reflect, so that some desired information can be calculated, and some scoring results and comprehensive rankings can be obtained. The correlation between traditional analysis indicators and assessment objects is different, so the weight is different, and the subjective assessment is inevitably biased and quiet [6], which has advantages in the comprehensiveness, simplification and complexity of data analysis, and improvement of accuracy and interpretability. Therefore, factor analysis is applied to many fields with its unique advantages and characteristics, such as psychology, pedagogy, market research and so on. More widely used in financial statistics applications, it can help us understand complex data structures and provide insight about the relationships between variables.

2. Construction of The Index System of Financial Performance Evaluation

2.1. Selected financial indicators

On the premise of reflecting the accuracy and integrity of the original variable information, it ensures that the possible linear relationship between the variable indicators is effectively avoided and the selected variables are reduced in dimension, because the core idea of factor analysis is to classify multiple variables into several potential factors in order to reveal the internal relationship between variables. Fewer factors explain most of the variability. Quoting Hu Jun [3], his basic definition model:

Set the original variables as $X_1, X_2, X_3, \cdots\cdots X_N$ mean of each variable zero and the standard deviation 1, as follows:

$$X_1 = a_{11}f_1 + a_{12}f_2 + a_{13}f_3 + \cdots a_{1k}f_k + \varepsilon_1$$
$$X_2 = a_{21}f_1 + a_{22}f_2 + a_{23}f_3 + \cdots a_{2k}f_k + \varepsilon_2$$
$$X_3 = a_{31}f_1 + a_{32}f_2 + a_{33}f_3 + \cdots a_{3k}f_k + \varepsilon_3$$
$$\cdots$$
$$X_k = a_{k1}f_1 + a_{k2}f_2 + a_{k3}f_3 + \cdots a_{kk}f_k + \varepsilon_k$$

The above matrix can be expressed as：

$$X = AF + \varepsilon$$

In the formula: A represents the factor load matrix; F is a common factor; ε is a special factor, representing the part that cannot be explained, which exists independently and has a mean of 0. Based on the principle of data practicality, this paper collected and consulted the annual report of SF Express and selected eight key indicators that can reflect the four major capabilities of the enterprise during 2014-2022, as shown in Table 1:

Table 1. Performance evaluation construction table of SF Express Company

Four abilities	financial index	X
profitability	overall yield	X_1
	net assets income rate	X_2
operation capacity	rate of stock turnove	X_3
	Accounts receivable turnover rate	X_4
debt paying ability	liquidity ratio	X_5
	asset-liability ratio	X_6
development ability	Revenue growth rate	X_7
	Net profit growth rate	X_8

2.2. Sample data selection

This paper chooses SF Express, a leading company in the express delivery industry, as a sample. Financial data of the company from 2014 to 2022 were collected through EastMoney.com, NetEase Finance and Jichao. In order to ensure the accuracy and practicability of the research, the above 8 financial indicators were selected as the basis to remove the incomplete data and errors, and statistical software SPSS26.0 was used for factor analysis to analyze and evaluate the company.

3. Empirical Analysis

3.1. KMO test and Bartlett ball test

Table 2 KMP test and Bartlett test KMO and Bartlett tests

KMO sample appropriateness measure.			0.575
Bartlett sphericity test	approximates	chi-square	60.589
	Degree of freedom		28
	significance		0.000

Data source: SPSS26.0 Statistics

The KMO test is a commonly used statistical method to evaluate the suitability and availability of data, especially in factor analysis and structural equation models. The KMO (Kaiser-Meyer-Olkin) test results range from 0 to 1, and the closer the value is to 1, the better the suitability of the data. The closer the KMO value is to 1, the better the suitability of the data, and we can perform factor analysis or structural equation model analysis. If the KMO value is lower than 0.5, the suitability of the data is poor, indicating that it is meaningless to do factor analysis or structural equation model analysis. Bartlett's spherical test is based on the principle of chi-square test, which is used to judge whether there is correlation between two variables and whether the correlation matrix is the identity matrix. We can verify that the value of KMO in Table 2 is 0.575, which is greater than 0.5, indicating that the suitability of each variable is good, and the degree of overlap is large, so it should be possible to obtain a more suitable factor analysis template. We can see from Table 2 that the significance level of the company is 0.00, which is less than the significance level 0.05, indicating that the company rejects the null hypothesis, or that the correlation between various variables is strong, indicating that the research of this data is suitable for factor analysis.

3.2. Total variance interpretation

Table 3. Total variance interpretation

Total variance interpretation

element	Initial eigenvalue			Extract the sum of squared loads			Rotating load sum of squares		
	aggregate	variance percentage	accumulate	aggregate	variance percentage	accumulate	aggregate	variance percentage	accumulate
1	4.194	52.419	52.419	4.194	52.419	52.419	3.552	44.395	44.395
2	1.709	21.361	73.780	1.709	21.361	73.780	1.945	24.313	68.708
3	1.412	17.656	91.436	1.412	17.656	91.436	1.818	22.728	91.436
4	0.557	6.966	98.402						
5	0.077	0.961	99.364						
6	0.028	0.353	99.717						
7	0.015	0.185	99.902						
8	0.008	0.098	100.00						

Extraction method: principal component analysis.

Data source: SPSS26.0 Statistics

From Table 3 we can see the three variable values, with a total of 8 initial eigenvalues explaining 100% of the original variable. The first original eigenvalue, 4.194, indicates that it carries information of 4.194 original variables; the second original eigenvalue, 1.709, and the third original eigenvalue, 1.412; and the three initial eigenvalues carry 91.436% of original variables. It can be seen that these three initial eigenvalues have explained most of the original variables. From this, it can be concluded that these three principal factors are sufficient to represent the selected variable.(Wen J 2016 [8]) We can see the sum of squares of rotating load from the far right of Table 3, and we can represent the selected variable from the three initial eigenvalues, so we can explain the sum of squares of rotating load around these three principal factors. It is not difficult to see from Table 3 that the initial values of the three principal factors are different from the sum of squares of the rotating load, but the cumulative ratio of the three principal factors is 91.436%, so it is again verified that the three principal factors can be used as common factors to explain the variables, and the financial performance evaluation of SF Express can be carried out.

3.3. Component matrix after rotation

Table 4. Component matrix table after rotation

	1	2	3
return on equity	-0.240	-0.240	0.907
liquidity ratio	-0.602	-0.322	-0.692
rate of stock turnover	0.897	0.391	0.154
turnover of account receivable	0.968	0.210	0.041
increase rate of business revenue	-0.066	0.856	0.046
net profit growth rate	0.857	-0.232	-0.221
asset-liability ratio	0.713	0.176	0.651
return on total assets	0.378	0.877	-0.132

Extraction method: principal component analysis.
Rotation method: Caesar's normalized maximum variance method.
a. Rotation has converged after 10 iterations.
Data source: SPSS26.0 Statistical analysis

According to the load component matrix in Table 4, we can see the value of the factor load coefficient. The stronger the degree of explanatory variables, the stronger the correlation. (Kang Daqing. Zhang Xumei 2003[9]).We can name factors according to the relationship between different variables, and the correlation between different variables, by the degree of explanation between different variables.

We can see from the component matrix table after rotation in Table 4 that the first common factor has the largest explanatory variable in inventory turnover and accounts receivable turnover, which are 0.897 and 0.968 respectively. We can see that the highest explanatory variable is 0.968. The minimum is more than 0.7, inventory turnover and accounts receivable turnover in the financial performance evaluation of the four capabilities belong to the operating capacity factor (F_1), can be named as the operating factor. The second common factor in Table 4 has a higher load capacity growth rate of operating income, the load capacity of these two indicators is higher, and the growth rate of operating income represents the development capacity in the four capabilities, we can call it the development capacity factor (F_2). The third common factor in Table 4 is the return on equity, which can be called the profitability factor (F_3).

3.4. Calculate the comprehensive score of the factors

Table 5. Component score coefficient matrix Component score coefficient matrix

	1	2	3
return on equity	-0.132	-0.101	0.551
liquidity ratio	-0.085	-0.092	-0.344
rate of stock turnover	0.229	0.083	0.002
turnover of account receivable	0.296	-0.039	-0.071
increase rate of business revenue	-0.174	0.527	0.035
net profit growth rate	0.359	-0.287	-0.214
asset-liability ratio	0.153	-0.015	0.309
return on total assets	-0.006	0.463	-0.113

Data source: SPSS26.0 Statistical analysis

From the bottom of Table 5, we can see which methods we used to calculate the component score coefficient [4], as shown in Table 5. I made assumptions based on the various financial indicators set in Table 1, and synthesized the calculation formula as follows:

$$F_1 = -0.06X_1 - 0.132X_2 + 0.299X_3 + 0.296X_4 - 0.85X_5 + 0.153X_6 - 0.174X_7 + 0.359X_8$$

$$F_2 = 0.463X_1 - 0.101X_2 - 0.083X_3 - 0.039X_4 - 0.092X_5 - 0.015X_6 + 0.527X_7 - 0.287X_8$$

$$F_3 = -0.113X_1 + 0.551X_2 + 0.002X_3 - 0.071X_4 - 0.344X_5 + 0.309X_6 + 0.035X_7 - 0.214X_8$$

We can explain the contribution ratio and accumulation ratio of each variable according to the total variance in Table 3. The contribution ratio of F_1、F_2 and F_3 is 44.395%, 24.313% and 22.728%, respectively, and the accumulation ratio is 91.436%. Then we can get the score function of SF Express's financial performance analysis:

$$F = (44.395\%F_1 + 24.313\%F_2 + 22.728\%F_3)/91.436\%$$

Table 6. The final score

a particular year	F_1	F_2	F_3
2014	-1.239	0.661	-1.168
2015	64.772	-29.4	-10.94
2016	19.781	37.366	1.964
2017	33.875	-11.87	-0.989
2018	30.125	-10.402	-0.933
2019	27.34	-9.654	-0.891
2020	28.228	-9.982	-0.776
2021	22.269	-7.909	-0.227
2022	19.657	-7.093	-0.094

Data source: SPSS26.0 Statistical analysis

3.5. Comprehensive analysis

We can first look at the first factorF_1, that is, the operating factor, as shown in 6, we can see that in addition to the big changes in 2014-2015 and 2015-2016, $F_2$and F_3also change greatly in these years, from 0.661 to -29.4, and then from -29.4 to 37.366. The fluctuation range is too large, indicating that the entire industry has just started to develop and change greatly, people's understanding of express is not mature enough, ups and downs, SF Express in recent years of unstable development, it can be said that the company ups and downs, the company has just become a little mature, the change range is very large. Other indicators do not change much, ups and downs, indicating that the company's operating capacity is in good condition, and the turnover speed of internal assets is good. The essence of operating capacity is that assets occupy as little time as possible, occupy as little resources as possible, and achieve as many times of turnover as possible to achieve better operation of the company. However, we can see from the financial statements of SF Express that the company's accounts receivable collection rate has been declining, indicating that the company's collection speed is slow and difficult. From Table 6, we can see that the operating capacity is basically declining and the company's asset investment is poor from 2017 to 2022. It shows that the company should adjust its own collection in a timely manner, and there are many large internal promotion capabilities.

Let's look at the second and three factors $F_2$and F_3, that is, the development ability factor and profitability factor. We can see from Table 6 that they are gradually increasing from 2017 to 2022, but the increase is not obvious, it has always been negative, and there is not much progress. The development prospect of the company is also getting better (Chen X L 2018), but the company's profit in recent years is not so good. The development ability of enterprises is not very good, the market share is also squeezed by peers, and the profit of time-sensitive parts is less than expected; New business growth is weaker than expected; Exceeding the expected capital expenditure indicates that the industry competition is becoming more and more fierce [2], and the company has problems in operation. The lack of reasonable internal planning and operation leads to weak profits of the company. The company should make reasonable planning policies to maintain steady development of the company.

4. Policies and Recommendations

4.1. Express focuses on the main business of direct sales, and the level of high-end products is clear

Express to focus on direct sales, the type of express is divided into two, on the one hand, the prescription business is divided into "express," "standard fast" two products, on the other hand, the e-commerce economic business will vigorously develop "electric trademark fast,"(Brown and Kohlbeck 2017[11]) but also to ensure the timeliness of express delivery, to improve customer satisfaction, to be fast, accurate, attitude is better, you can optimize the company's business, the development of high-end products. With the improvement of customers' consumption level,(Berry and Routon 2020[11]) consumers' requirements for middle and high-end services continue to increase, and enterprises should clearly position themselves, shape the company image, and develop and innovate. Products to focus on the level of high-end direct sales, help express business profit steady growth.

4.2. Prescription business

To make the express faster, to ensure that the quality of the bad and smelly express to the customer's hands is good, although it cannot guarantee that all are not bad, it is almost not bad, to take into account the recovery of the high-end consumer economy and the growth of the company's return and replacement business volume, in economic business, to the price with relatively high electricity trademark fast development focus, Continue to be optimistic about the inflection point of business operation + cash flow inflection point to enhance the value of the company in the future development process to focus on improving the company's development ability. (Brown et al 2013[13]) Sufficient attention is paid to evaluating the service quality of third-party logistics service providers through customer feedback and the impact of such service quality on their financial, operational and comprehensive performance, and combining text mining methods (such as topic modeling, LDA and sentiment analysis) to analyze the impact of service quality obtained through customer reviews on their financial and operational performance. This research gap has been solved [9].

4.3. Continuous optimization of supply chain

Enterprises should continue to improve their service quality, as far as possible to enhance the experience of consumers, the express industry should also start to "roll up" in terms of

timeliness and service, but do not consume each other internally, to continue to optimize the supply chain of express enterprises, to strengthen and complement the service shortcomings, the most important thing for enterprise optimization is to improve service quality and rebuild brand image.(Kabassi et al 2020[15])To standardize the price system and optimize the development of afterlife enterprises, it is necessary to focus on the "first kilometer" and "last kilometer" in urban and rural areas(Lima Junior et al 2014[14])_to ensure customer satisfaction and business confidence. To carry out a wide range of delivery to ensure timeliness, in improving the company's service, but also to appease the heart of the Courier brother, through the establishment of relatively stable labor relations, strengthen the service guarantee of couriers, service can be optimized, in order to allow the company to develop rapidly. We want to focus on online reviews that transcend the boundaries of space and time, are visible to the masses, and can have a powerful impact on business. If a company gets a positive word of mouth on an online review platform, it is likely to get more business in the future.

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