

Financial performance evaluation of Chinese smart logistics enterprises

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Abstract: Under the background of "Industry 4.0" and "Internet +" development, the intelligent logistics system is the only way for the development and transformation of China's logistics industry. However, at present, the scientific research investment and intelligent equipment purchase and repair costs of the smart logistics transformation of logistics companies is huge, and it is difficult to maintain the balance between the production cost and profit. Therefore, how to evaluate objectively, fairly and effectively the business performance of enterprises has become an urgent problem to be solved by China's smart logistics enterprises. Based on this, this paper selects the wisdom of 18 listed companies in the logistics industry financial performance evaluation, financial indicators and the financial indicators for soft, respectively from five different dimensions to establish index system, using the entropy method of objective evaluation, finally get the enterprise financial performance evaluation, and according to the industry situation put forward the corresponding policy Suggestions.

1. Foreword

With the rapid development of science and technology and big data, enterprises in the logistics field have laid out the smart logistics industry, and smart logistics has become a hot spot in the development of the logistics industry. In the stage of high-quality economic development, it is of great significance to improve the financial performance level of enterprises to achieve high-quality development. Therefore, the financial performance evaluation of smart logistics enterprises has become an important research issue under the development system of the logistics industry, which can reflect the development status of China's smart logistics industry, and also provide important data support for smart logistics enterprises to make strategic decisions.

The existing performance evaluation mainly focuses on the research and discussion of logistics enterprises. Liu Mengbo (2018) used the AHP method to measure the importance of various financial indicators of S logistics enterprises with the financial performance model built. Du zhiping[1](2020) Combine the ultra-efficiency DEA and AHP method to evaluate the operational performance level of cross-border e-commerce logistics enterprises. Li Xiaojin (2020)[2] Combining the optimal and worst subjective method (BWM) and the objective

method grey correlation analysis method (GRA), it is found that there is still a certain gap between domestic express enterprises and foreign countries in terms of solvency. Hou Xianganding (2021)[3]Based on the index system based on the four dimensions of enterprise profitability, solvency, operation capacity and development ability, the policy suggestions of improving the integration ability of logistics supply resources are put forward.

However, there is insufficient research literature on the financial performance of the smart logistics industry, and there are few empirical studies, and non-financial indicators are not considered in the financial performance evaluation. Based on this, this paper weakens the financial indicators and non-financial indicators to further evaluate the financial performance of intelligent logistics enterprises, and uses the entropy method to objectively and fairly measure the impact of different indicators on enterprise performance.

2. Establishment of index system and data source of intelligent logistics enterprises

2.1 The basis of establishing the index system of intelligent logistics enterprises

Through relevant literature, the construction of the logistics enterprise performance evaluation index system mainly includes financial indicators, the construction of the financial indicators is relatively few, the financial index evaluation is the recessive status of the enterprise, also has a crucial influence on the development of the enterprise, only the financial indicators and financial indicators for comprehensive evaluation, comprehensive and systematic evaluation of the comprehensive quality of an enterprise. In terms of index selection, this paper weakens the financial indicators and non-financial indicators, and finally selects five parts: solvency, operating ability, profitability, development ability and non-financial indicators to establish the evaluation index system.

Profitability is the most important measurement standard for enterprises, and also an important index to find problems, solve problems and guide enterprises to break through their development. This paper selects return on equity and profit margin to measure profitability; solvency refers to the ability to repay debts, which can reflect the financial condition and risk of enterprises. This paper selects four indexes of asset-liability ratio, current ratio, quick ratio and equity multiplier to measure the solvency; the operation capacity can reflect the capital turnover of an enterprise, and an enterprise needs to create value through capital flow. In this paper, the accounts receivable turnover, inventory turnover and total asset turnover to measure the operation capacity; the development ability to judge the development potential of an enterprise, can effectively discover the enterprise value and avoid the short-term behavior; the growth rate of main business income, growth rate of net profit and growth rate of total assets to measure the development ability[4]. Non-financial indicators can curb the short-term behavior caused by the evaluation of financial indicators, and are conducive to maximizing the long-term interests of enterprises. As an industry relying on information technology development, intelligent logistics enterprises need a large number of scientific research investment and scientific research talents. At the same time, as a rising industry needs more extensive support from the society, and the financial indicators do not take into account these factors. Based on this, this paper constructs a non-financial index system, and selects five indicators: investment rate of R & D expense, rate of research personnel, employee profit level, logistics market share and donation income ratio as the standards to measure non-financial indicators.

2.2 Data sources of smart logistics enterprises

Through the research on the financial performance of listed enterprises in intelligent logistics

enterprises, it is beneficial to understand the development status of China's logistics industry, and it is of great significance to promote the transformation and upgrading of logistics enterprises and realize the development of higher quality. According to the classification of Oriental Wealth industry in this paper, 18 intelligent logistics listed logistics enterprises are selected as the research objects, and the relevant index data are extracted according to the annual reports of each enterprise of Oriental Wealth network.

In this paper, the selected data were preprocessed, mainly for the reverse index processing and moderate index processing. Among the 17 indicators selected in this paper, the equity multiplier is the reverse indicator, and the following formula is used:

$$X_i = \frac{1}{k_i} \quad (1)$$

k_i Where, select the original value of the index; it is the processed value. X_i

At the same time, the article gives a moderate treatment to the moderate indicators. In the solvency, the asset-liability ratio is used to measure the ability of enterprise business activities, the index value is too low is the ability to use external funds is relatively weak, the index value is too high enterprise debt repayment risk is larger, through the relevant information query, in the wisdom logistics industry, the asset-liability ratio of 50%~70%, the same quick ratio and current ratio as the evaluation index of solvency, in the wisdom logistics industry performance evaluation for moderate index, and the current ratio of moderate range is 1.5~2, quick ratio generally think 1 is appropriate. x The formula for processing moderate indicators is as follows (used to represent processed data). x'

$$x' = \begin{cases} \frac{b-a}{2} - \left(\frac{a+b}{2} - x \right), & x > \frac{a+b}{2} \\ x, & x \leq \frac{a+b}{2} \end{cases} \quad (2)$$

3. Performance analysis of intelligent logistics enterprises based on entropy value method

3.1 Research ideas

In the current academic research, the empirical analysis of the index model of financial performance mainly includes factor analysis method, principal component analysis method, entropy value method method and other solutions. In the research process of this paper, although the relevant evaluation index system has been determined, the weight of various indicators is not easy to be determined. At the same time, the more indicators and selected enterprises in the index system can lead to more research elements, so it is impossible to intuitively judge which one and the intelligent logistics enterprise has the best performance. Entropy method is an objective empowerment method, which determines the weight of the index according to the size of the information provided by the observed value of each index. It has the characteristics of conciseness and objectivity, and is suitable for the empirical evidence of this model.

3.2 Entropy method

Entropy method [5] refers to a mathematical method used to determine the degree of dispersion of an index. The greater the degree of dispersion, the greater the influence of the index on the comprehensive evaluation. The specific steps of the entropy method are as follows:

The first step, data standardization processing. To avoid model learning errors caused by differences in data dimensions, the sample data is normalized according to the following formula:

$$x'_{ij} = \frac{x_{ij} - x_{\min}}{x_{\max} - x_{\min}} \quad (3)$$

Since the 0 value appears after standardization, the normalized data is translated:

$$x''_{ij} = x'_{ij} + 0.0001 \text{ (0.0001 is the offset)} \quad (4)$$

The second step is to calculate the i region as the weight of the j index

$$p_{ij} = \frac{x''_{ij}}{\sum_{i=1}^n x''_{ij}} \quad (5)$$

Where, p_{ij} is the proportion of the index value under the j index, x''_{ij} is the standardized data matrix after translation.

The third step is to calculate the entropy value of the j -item index:

$$e_{ij} = -\frac{1}{\ln(n)} \sum_{i=1}^n p_i \ln(p_{ij}) \quad (6)$$

In the fourth step, normalize the difference coefficient and calculate the weight of item j :

$$w_j = \frac{g_j}{\sum_{i=1}^m g_j} \quad (7)$$

Is the weight of the j , and the difference coefficient of the j , where $g_j = 1 - e_j$

Step 5, calculate the final total score:

$$M_i = \sum_{j=1}^m w_j x''_{ij} \quad (8)$$

3.3 Analysis of the empirical results

3.3.1 Analysis of the weight calculation results of the index Angle

According to Table 1, the donation income ratio has the largest weight and the largest degree of dispersion. To a large extent, the income donation ratio reflects a large proportion of the social benefits of enterprises. Appropriate social donation can bring positive social impact to enterprises, thus improving the corporate image, promoting the cooperation among stakeholders, and also play an important role in improving the financial performance of enterprises. The second and third index weights are logistics market share and inventory turnover respectively. At present, the development of intelligent logistics industry in our country is in the basic period to import the transition stage, the future has a larger development space, the industry market share did not form a trend of dominant enterprise, the wisdom logistics market share of the largest two enterprises respectively Xiamen xiangyu, motion holdings, the wisdom of the two companies and other enterprises logistics market share gap is not big.

As an evaluation index of the operation capacity of intelligent logistics enterprises, the inventory turnover rate can be used to measure and evaluate the comprehensive management index of the inventory, production and sales recovery of logistics enterprises. The higher the index value, the higher the efficiency of the enterprise's capital investment in resources. In the

index evaluation system, the return on equity has the smallest weight. Return on equity is an indicator to measure the long-term profitability of an enterprise. As the current development time of smart logistics is shorter than that of traditional logistics, the difference between the above companies is not large.

Table 1. Each weight index

Level 1 index name	Secondary index name	Corresponding weight
profitability 0.0196	Return on equity	0.0068
	ratio of income as a percentage of sales	0.0128
debt paying ability 0.0506	asset-liability ratio	0.0230
	current ratio	0.0084
	quick ratio	0.0073
	equity multiplier	0.0119
operation capacity 0.3038	average accounts receivable turnover ratio	0.0884
	inventory turnover ratio	0.1613
	turnover of total capital	0.0541
Development ability 0.0719	Growth rate of main business revenue	0.0295
	net profit growth rate	0.0177
	Total asset growth rate	0.0247
Non-financial indicators 0.5543	R & d expense investment rate	0.0702
	Scientific research personnel rate	0.0713
	Employee profit level	0.0316
	Logistics market share	0.1665
	Donate income ratio	0.2147

3.3.2 Analysis of enterprise score perspective

2As can be seen from Table 2, no total score of an enterprise far exceeds other enterprises, indicating that there is no leading enterprise or monopoly enterprise in this industry at present, which is basically balanced development. At present, under the environment supported by national policies, major enterprises are actively integrating industrial resources, and are still constantly exploring the intelligent logistics development mode and realization path of "Internet + logistics", so as to realize the comprehensive transformation and upgrading of the logistics industry[6]. In terms of the overall score, the bonded technology scored the highest, mainly due to its non-financial indicators. Bonded Technology is an innovative comprehensive logistics service provider integrating terminal warehousing business, intelligent logistics e-commerce platform and supply chain gold.

In recent years, compared with express logistics and e-commerce, although the logistics of means of production represented by bulk commodities has problems such as relatively slow development, low industry attention and backward logistics technology means. However, there are more than 1,000 kinds of bulk commodities, which is the cornerstone of the national economy and more related to the national economy and people's livelihood. Therefore, improving the development space and potential of bulk commodity logistics and making bulk commodity logistics develop towards the direction of wisdom is the future of bulk commodity logistics, and also the inevitable trend of the development of smart logistics. And bonded science and technology main business for port, wharf, logistics, is now by relying on wisdom logistics electric business platform, by expanding mode, expanding varieties, expanding area, in commodity trading, circulation, financing innovation application of digital solutions, build commodity supply chain integration. At the same time, compared with other enterprises, the

non-financial indicators of bonded technology has prominent advantages with other enterprises, and has great advantages in terms of scientific research cost investment, talent attraction and positive social impact. Tianshun shares have the lowest score, in the scientific research cost investment, talent attraction and other aspects still need to strengthen, but compared with other enterprises, the overall gap is not large.

Table 2. Score of each index of smart logistics enterprises

enterprise	profitability	debt paying ability	operation capacity	Development ability	Non-financial indicators	Total score
Bonded technology	0.0118	0.0119	0.0937	0.0071	0.2395	0.3639
Xiamen elephant island	0.0105	0.0386	0.1115	0.0304	0.1688	0.3597
Innovation logistics	0.0106	0.0359	0.2178	0.0548	0.0100	0.3290
Sinotrans	0.0110	0.0418	0.1731	0.0322	0.0638	0.3219
China trade logistics	0.0114	0.0377	0.1720	0.0457	0.0262	0.2930
Today international	0.0114	0.0440	0.0113	0.0416	0.1436	0.2518
SF Holding	0.0107	0.0406	0.0428	0.0365	0.1090	0.2396
China Reserve shares	0.0100	0.0360	0.1214	0.0331	0.0370	0.2375
University of Science and Technology intelligence	0.0089	0.0398	0.0039	0.0273	0.1516	0.2315
Nori shares	0.0115	0.0332	0.0156	0.0341	0.1074	0.2019
HongChuan wisdom	0.0185	0.0430	0.0277	0.0248	0.0616	0.1757
Ningbo dongli	0.0168	0.0376	0.0103	0.0182	0.0825	0.1654
East jie intelligence	0.0113	0.0382	0.0041	0.0159	0.0929	0.1624
Mike shares	0.0124	0.0311	0.0024	0.0342	0.0810	0.1611
Iron dragon logistics	0.0105	0.0222	0.1019	0.0160	0.0067	0.1572
Jiangsu Xinning Modern Logistics Co	0.0000	0.0135	0.0162	0.0203	0.0966	0.1465
Ka Cheng international	0.0136	0.0287	0.0071	0.0228	0.0390	0.1113
Tianshun shares	0.0110	0.0359	0.0181	0.0297	0.0082	0.1028

3.3.3 K-means analysis

Table 3. Comprehensive evaluation grade of enterprises

enterprise	Performance category	enterprise	Performance category
Bonded technology	ample	Nori shares	good people
Xiamen elephant island	ample	HongChuan wisdom	same as
Innovation logistics	ample	Ningbo dongli	same as
Sinotrans	ample	East jie intelligence	same as
China trade logistics	ample	Mike shares	same as
Today international	good people	Iron dragon logistics	same as
SF Holding	good people	Jiangsu Xinning Modern Logistics Co	same as
China Reserve shares	good people	Ka Cheng international	difference
University of Science and Technology intelligence	good people	Tianshun shares	difference

3According to the total score, the K-means clustering algorithm is used to rank the

enterprises, and the results are shown in Table 3. The first echelon enterprises with excellent performance are: Bonded Technology, Xiamen Xiangyu, Zhongchuang Logistics, Sinotrans and Huamao Logistics. They have good performance in non-financial indicators and operational ability, which are worthy of reference from other enterprises. At the same time, the total score of different types of enterprises is less, the industry has not formed a monopoly of the enterprise, the industry has a huge market potential, has a good development prospect.

4. Policy recommendations and conclusions

4.1 Policy recommendations

With the rapid development of the Internet and artificial intelligence, intelligent logistics enterprises should actively promote digital reform and constantly improve their performance level. In terms of profitability, smart logistics enterprises should be liberated from the traditional logistics business such as transportation, warehousing, loading and unloading and handling, make full use of information technology to innovatively develop new logistics business innovatively, attach importance to the introduction of innovative talents, and develop their own core competitiveness by combining China's national conditions and policies. In terms of solvency, smart logistics enterprises should strengthen the daily management of inventory to reduce raw material inventory; in terms of operating capacity, enterprises should strengthen performance management and provide effective incentives. Among the indicators of operating capacity, inventory turnover has the largest weight. Therefore, enterprises should improve the speed of inventory circulation, and rely on the Internet platform to increase sales and production efforts. In terms of development capacity, attention should be paid to cost management and the introduction of scientific and technological achievements as well as independent research and development. Leaders should have a long-term development vision, seize opportunities and face up to challenges. In addition, enterprises should also pay attention to the important impact of non-financial factors on their own performance, improve their awareness of social responsibility, and rely on intelligent information technology to achieve leapfrog development.

4.2 Conclusion

For the entropy method, the larger the weight means the greater the degree of data dispersion. Through the above research, it is found that the weight distribution of 14 indicators is generally uniform, but the three indicators of donation income ratio, logistics market share and inventory turnover ratio are more scattered. Some of the above enterprises do not make social donations or make relatively few donations, resulting in the increased dispersion of index donation income ratio; the different strategic positioning causes different market positions; and different inventory turnover rates due to different business scope and goods storage. At the same time, the total score of each echelon enterprise is not much different, so the monopoly trend of leading enterprises has not been formed, and the development of the whole industry has great potential.

This paper only considers the annual data of each enterprise in 2022, and does not consider the industry changes caused by the time dimension. Follow-up research can consider the construction of deep learning model to evaluate and predict the development of smart logistics enterprises and the industry.

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