

## Research Article

# Evaluation on Performance of Domestic A-Share Listed Cross-Border E-Commerce Export Enterprises Based on Hierarchy Process and Grey Correlation

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According to the three principles of cross-border export trade such as the main business, physical transaction, and data availability, eight domestic A-share listed cross-border e-commerce export enterprises are selected to build a performance evaluation index system integrating operation ability, solvency, profitability, and growth ability. Based on the three-year annual public report data from 2018 to 2020, the grey correlation degree and ranking of the performance of eight enterprises are calculated by using the hierarchical method and grey theory. Excluding the factors of COVID-19 outbreak, the two aspects of operation capability and solvency are the key factors that affect the performance of such enterprises at the present stage. It provides reference for the development of cross-border e-commerce enterprises in China and also provides some reference for other types of e-commerce enterprises.

## 1. Introduction

The meaning of cross-border e-commerce means that different trading subjects use Internet technology and e-commerce platform to carry out international trade, that is, to complete transactions, payment and settlement through the platform, and to complete the delivery of goods through cross-border logistics [1]. In the early days, Chinese cross-border e-commerce enterprises mainly carried out cross-border publicity, display, and transaction negotiations through B2B platform. With the wide application of the Internet and the further upgrading of online or third-party payment methods, the international logistics system has been gradually improved. As of October 2021, the number of comprehensive cross-border e-commerce pilot zones in China has reached 105, and the scale of the industry has increased nearly 10-fold in the past five years, making it the leader in the world. Especially, in the past two years, with the

continuous improvement of China's independent innovation capability, China's cross-border e-commerce export began to transform from "made in China" to "Chinese brand" [2]. Under the background of insufficient domestic demand and the epidemic situation of COVID-19, the impact of the performance of export-oriented cross-border e-commerce enterprises on the national economy is very important, and it is urgent to study the performance of such enterprises.

## 2. Brief Introduction of Research Literature on Performance of Cross-Border E-Commerce Enterprises

In the research of cross-border e-commerce enterprises, most of the literature focuses on the influencing factors faced by industry enterprises and future development plans, and there is little literature on the performance of cross-border e-commerce export enterprises.

Li Zhengwei took SUNING.COM enterprise as an example to make an empirical analysis of its three-year financial statements by the factor analysis method and finally obtained the ratio of business performance, operating efficiency, and capital structure of e-commerce enterprises. Li Fenggang and Chen Fangfang also used the Malmquist index in the data envelopment analysis method to analyze the static and dynamic efficiency of the operation efficiency of cross-border e-commerce enterprises and proposed to improve the operation efficiency of enterprises by means of fine operation, advanced management, and control of operation costs [3]. Cui Yi pointed out that cross-border e-commerce platforms should continuously improve consumers' willingness to use to promote the development of cross-border e-commerce. Du Zhiping and Zhang Meng established the superefficient data envelopment analysis (DEA-IAHP) method to evaluate the performance of cross-border e-commerce logistics enterprises and quantify the influencing factors such as enterprise resource utilization level, performance contribution, and risk-taking ability, so as to determine the comprehensive performance level of enterprises [4]. Xu Xiaoya proposed that we should build a cross-border e-commerce ecosystem at the government level, reduce the entry threshold for enterprises, improve infrastructure construction, promote the development of industrial agglomeration, develop new business forms at the enterprise level and balance various modes of development, increase cross-border e-commerce talent training and school enterprise cooperation at the university level, and jointly develop at the three levels to promote the coordinated development of cross-border e-commerce [5].

M.S. Irwan Hariandi considered that competitive advantage has a direct impact on enterprise performance [6]. Arunas Burinskas established a cash flow model that can be used for efficiency evaluation, compared the benefits of traditional trading enterprises and cross-border e-commerce enterprises, proposed that the implementation of e-commerce technology can reduce transaction costs in terms of enterprise employees and long-term tangible asset investment, and obtained that cross-border trading enterprises can better improve enterprise performance by using e-commerce technology and economies of scale [7]. Professor Hamed Taherdoost of the University of St. Petersburg, Russia, studied the applicability of the customer satisfaction model, tested the role of the e-service satisfaction model in the customer interaction of cross-border e-commerce enterprises through content validity, exploratory factor analysis, constructive test, and cluster discrimination, and also proved the training, performance, user friendliness, trust, availability, security quality, and design which have a direct and significant impact on cross-border e-commerce satisfaction [8].

According to the above and based on the few literature studies in recent three years, the research on cross-border e-commerce enterprise performance is mainly targeted at case and industry, emphasizes on the key factors that influence the performance, and adopts the research methods such as hierarchical method, data envelopment, and cash flow. At present, the research on the performance of

domestic listed cross-border e-commerce export enterprises is only mentioned in individual master's theses, such as Li Yanzhi's "Evaluation of the Growth Capacity of Cross-Border E-Commerce Export Enterprises," in which the traditional trading enterprises with some cross-border e-commerce businesses are selected, including SUNING.COM and Haining Leather, and these enterprises are not completely comparable with the enterprises mainly engaged in cross-border e-commerce export in performance research. It can be said that the research on the performance of domestic cross-border e-commerce export enterprises is almost blank.

### 3. Performance Evaluation Model of Domestic A-Share Listed Cross-Border E-Commerce Export Enterprises

*3.1. Evaluation Index System of Domestic A-Share Listed Cross-Border E-Commerce Export Enterprises.* The performance of domestic A-share listed and exported cross-border e-commerce enterprises is the comprehensive performance of their operation ability, solvency, profitability, and growth ability in the market from the macro and micro, long-term and short-term, and dynamic and static point of view. Based on the objectivity and scientificity of the research and to ensure the accuracy and availability of the data sources of the evaluation index system, 19 secondary indicators are selected, respectively, on the basis of the four index systems, to comprehensively build a performance evaluation index system suitable for domestic A-share listed cross-border e-commerce enterprises.

*3.1.1. Operational Capacity.* At present, domestic cross-border e-commerce export enterprises are in the transition stage of development. Their viability is a very important factor and the embodiment of their input-output efficiency. The indicators that can represent the operation capacity are often directly related to the enterprise turnover capacity, labor efficiency, accounts receivable turnover rate, inventory turnover rate, current asset turnover rate, and total asset turnover rate which can be used as the secondary indicators of operational capacity.

*3.1.2. Solvency.* An industry is in the transition stage of development, so it is particularly important for enterprises to have a good ability to pay and repay debts. Solvency refers to the ability of an enterprise to repay long-term or short-term debts. When an enterprise has more capital investment and sufficient payment ability, it can also play a very key role in its reputation in the market. Therefore, five indicators are selected to measure solvency: asset liability ratio, current ratio, quick ratio, cash ratio, and cash to interest guarantee ratio.

*3.1.3. Profitability.* Profitability refers to the ability of enterprises to make profits. It is also an important indicator to measure the income level of a cross-border e-commerce export enterprise in a certain period of time. However, in the

growth period of an industry, short-term profitability is not the most important factor. Finally, it is measured by four indicators: earnings per share, dividend per share, P/E ratio, and net assets per share of A-share listed enterprises.

**3.1.4. Growth Ability.** The performance of any enterprise can not only look at short-term and static financial data. The growth ability can better reflect the long-term comprehensive performance of domestic A-share listed and cross-border e-commerce export enterprises. It is precisely due to the rapid growth of the industry that its growth ability is the fundamental guarantee for the medium- and long-term healthy growth of the industry. The growth rate of main business income, operating profit, net profit, net assets, and total assets are adopted to reflect the ability of the enterprise to develop and grow in the future.

The above four primary indicators and nineteen secondary indicators jointly build the performance evaluation index system of domestic A-share listed cross-border e-commerce export enterprises (Figure 1).

**3.2. Performance Evaluation Model of Domestic A-Share Listed Cross-Border E-Commerce Export Enterprises**

**3.2.1. Construction of the Evaluation Index System and Calculation of the Weight of Each Index.** According to the idea of the hierarchical method, there are four primary indexes and nineteen secondary indexes, and the one-target two-level each-two-judgment matrix  $A_n$  is constructed by use of the nine-point scoring method, of which there is one judgment matrix at the first level and four judgment matrices at the second level, and the maximum characteristic root is marked as  $\lambda_{\max}$ . According to the square-root method, the weights of evaluation indexes of the five judgment matrices at the first level and the second level are calculated, respectively, and finally, the combined weights of all the secondary indexes are obtained by use of multiplication principle, which is marked as  $(\phi_1, \dots, \phi_n)$ .

There may be subjective contradictions in the nine-point scoring method, so the consistency test should be done for the judgment matrix  $A_n$ . The calculation formula of square-root method is as follows:

$$\begin{aligned} \bar{\phi}_i &= \sqrt[n]{\prod_{j=1}^n c_{ij}}, \\ \phi_i &= \frac{\bar{\phi}_i}{\sum_{i=1}^n \bar{\phi}_i}, \\ \lambda_{\max} &= \sum_{i=1}^n \frac{\sum_{j=1}^n c_{ij} \phi_j}{n \phi_i}, \\ C.I &= \frac{\lambda_{\max} - n}{n - 1}. \end{aligned} \tag{1}$$

$C.I \leq 0.1$ , and then, the judgment matrix  $A_n$  is satisfactory.

**3.2.2. Standard Processing of Original Data.** The original index data of 19 secondary indicators collected for each A-share listed cross-border e-commerce export enterprise shall be standardized; it is supposed that the original data of the  $j$ th index of the  $i$ th A-share listed cross-border e-commerce export enterprise are  $f_{ij}$ , the maximum and minimum values of the  $j$ th index of the  $i$ th A-share listed cross-border e-commerce export enterprise are  $Q_j$  and  $q_j$ , respectively, and the standard data are  $y_{ij}$ , which constitute the standard series  $Y_i$  of performance indicators of the  $i$ th A-share listed cross-border e-commerce export enterprise; the maximum value of each standard data is taken to constitute the optimal indicator series  $Y_0$  for the performance of the A-share listed cross-border e-commerce export enterprise. All raw data are divided into two categories: one is the maximum data, i.e., the larger the data value is, the better the performance (e.g., the data of profit), and the other is the small data, i.e., the smaller the data value is, the better the performance (e.g., data of cost). The standard data processing formula is as follows.

Maximum data conversion:

$$y_{ij} = \frac{f_{ij}}{Q_j}. \tag{2}$$

Minimum data conversion:

$$y_{ij} = 1 + \frac{q_j}{Q_j} - \frac{f_{ij}}{Q_j}. \tag{3}$$

**3.2.3. Calculation of Grey Correlation.** The correlation coefficient  $\beta_{ij}$  is the relative difference between the standard series  $Y_i$  and the optimal index series  $Y_0$  in the  $j$ th index of the  $i$ th A-share listed cross-border e-commerce export enterprise. The larger the difference value indicates that the higher the correlation is and the better the performance of single index is:

$$\beta_{ij} = \frac{\min_i \min_j \Delta_{ij} + \rho \max_i \max_j \Delta_{ij}}{\Delta_{ij} + \rho \max_i \max_j \Delta_{ij}}. \tag{4}$$

In the formula,  $\Delta_{ij} = |y_{0j} - y_{ij}|$ ,  $\rho$  is called resolution coefficient, generally  $\rho = 0.5$ , the value of  $\rho$  is different, and it does not change the correlation order. The correlation coefficient can only reflect the correlation order. The correlation coefficient can only reflect the correlation between one of the 19 evaluation indicators and the optimal index but cannot reflect the performance of an A-share listed cross-border e-commerce export enterprise on the whole, so it is reflected by the grey correlation, and the grey correlation of the index weight is added as follows:

$$\theta_i = \sum_{j=1}^n \varphi_j \beta_{ij}. \tag{5}$$

The higher the  $\theta_i$  value of grey correlation, the better the performance of the  $i$ th A-share listed cross-border e-commerce export enterprise [9].

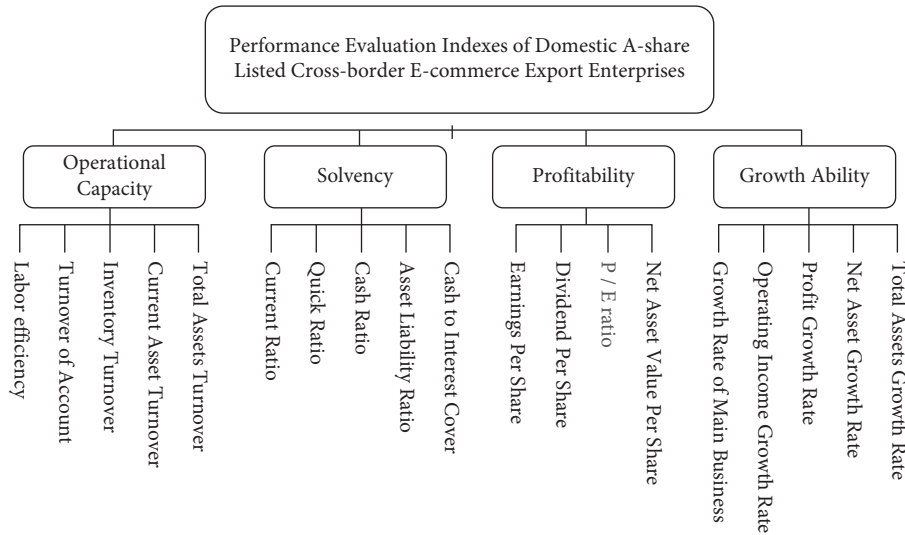


FIGURE 1: Performance evaluation index system of domestic A-share listed cross-border e-commerce export enterprises.

TABLE 1: The index right at the first level of performance evaluation indexes of domestic A-share listed export e-commerce enterprises.

A	A1	A2	A3	A4	$\phi_i$	$\lambda_i$
A1	1	1	3	2	0.36468755	1.016901367
A2	1	1	2	1	0.277102615	1.015143108
A3	1/3	1/2	1	1/2	0.125195239	1.002067581
A4	1/2	1	2	1	0.233014596	1.011579834
					1	$\lambda_{\max} = 4.045691889$ $C.I = 0.01523063$

### 4. Empirical Analysis

At the present stage, A-share listed enterprises with cross-border e-commerce export as main business or as main development direction can be divided into two types: first, it is self-operated enterprises, which mainly export commodities to other countries through third-party platforms or self-built websites; second, it is platform enterprises, which mainly integrate the enterprises of both sides of cross-border transactions and facilitate cross-border transactions through the development and construction of cross-border e-commerce platforms.

Based on the three principles of main business, physical transaction, and data availability shown in the annual report of enterprises, eight A-share listed enterprises with certain representativeness in cross-border e-commerce export industry are selected as samples, including two platform enterprises of Lianluo Interactive and Focus Technology and six self-operated enterprises such as Anker Innovations, Contec, Guangbo, and Huading.

According to the listing situation of each enterprise, the sample data mainly come from the annual reports of the enterprises in 2018, 2019, and 2020. Anker Innovations terminated the listing on the New Third Board in 2018 and was officially listed on the A-share GEM in 2020, and Contec also listed on Shenzhen Stock Exchange in 2020, so only the data of the annual reports of two enterprises in 2020 were cited.

In terms of calculation of indicator data, there are two groups of data to be explained.

First, it is the protection multiple of cash to interest, which should be equal to the sum of net cash flow generated

from operating activities and cash income tax divided by cash interest expenditure. Because the data source is difficult to collect, it is roughly replaced by the divisor of total profit and interest expense; second, it is P/E ratio. The P/E ratio may vary with the daily stock price and earnings per share, so the P/E ratio of the last trading day of each year shall prevail. Among them, Anker Innovations cannot collect the P/E ratio of the last trading day in 2020, and the divisor of the market value and the net profit of the Company in 2020 is adopted.

- (1) According to the established performance evaluation index system of domestic A-share listed and exported e-commerce enterprises, the weight of each index is calculated by using the hierarchical method. Due to the word limitation, the calculation process, consistency test, and results of index weights of the primary index system and comprehensive index system are given, as shown in Tables 1 and 2.
- (2) The index data of 8 domestic A-share listed cross-border e-commerce export enterprises are collected and standardized, shown in Table 3. The original data are omitted due to word limitation.
- (3) The correlation coefficient and grey correlation of performance indicators of 8 domestic A-share listed cross-border e-commerce export enterprises are calculated, and a clearer comparison of 19 indicators grey correlation coefficient of 8 enterprises is made through line chart, as shown in Tables 4–6 and Figure 2.

TABLE 2: Comprehensive weight of performance evaluation indexes of domestic A-share listed export e-commerce enterprises.

		Weight at the first level	Weight at the second level		Comprehensive weight
Weight of performance evaluation index system of domestic A-share listed export e-commerce enterprises	Operational capacity	0.36468755	Efficiency of labor	0.299759886	0.109318699
			Turnover of account receivable	0.10230168	0.037308149
			Inventory turnover	0.246365431	0.089846405
			Turnover ratio of current assets	0.240629719	0.087754663
	Solvency	0.277102615	Total asset turnover	0.110943284	0.040459634
			Current ratio	0.112466333	0.031164715
			Quick ratio	0.184866741	0.051227057
			Cash ratio	0.329543907	0.091317478
	Profitability	0.125195239	Asset liability ratio	0.129189892	0.035798857
			Protection multiple of cash to interest	0.243933127	0.067594507
			Earnings per share	0.468730787	0.058682863
			Dividend per share	0.102814068	0.012871832
	Growth ability	0.233014596	P/E ratio	0.278708993	0.034893039
			Net assets per share	0.149746152	0.018747505
			Growth rate of main business income	0.297272694	0.069268877
			Growth rate of operating profit	0.110022756	0.025636908
			Growth rate of net profit	0.297272694	0.069268877
			Growth rate of net assets	0.191560745	0.04463645
			Growth rate of total assets	0.10387111	0.024203485

TABLE 3: Performance evaluation standard data of domestic A-share listed cross-border e-commerce export enterprises.

Registered address	Hangzhou	Nanjing	Changsha	Qinhuangdao	Ningbo	Huzhou	Yiwu	Nanjing	
Company name	Lianluo interactive	Focus technology	Anker innovations	Contec	Guangbo	Henglin	Huading	Tianze information	
Operational capacity	Efficiency of labor	1.00	0.08	0.70	0.17	0.15	0.08	0.28	0.20
	Turnover of account receivable	0.30	1.00	0.63	0.84	0.21	0.32	0.49	0.16
	Inventory turnover	0.18	1.00	0.07	0.05	0.17	0.12	0.11	0.07
	Turnover ratio of current assets	1.00	0.29	0.95	0.78	0.79	0.60	0.94	0.58
Solvency	Total asset turnover	0.68	0.19	1.00	0.54	0.61	0.43	0.57	0.41
	Current ratio	0.22	0.41	1.00	0.51	0.29	0.55	0.37	0.54
	Quick ratio	0.24	0.54	1.00	0.53	0.33	0.60	0.35	0.52
	Cash ratio	0.10	0.69	0.34	1.00	0.12	0.38	0.19	0.26
Profitability	Asset liability ratio	0.32	0.86	1.00	0.95	0.58	0.85	0.73	0.91
	Protection multiple of cash to interest	-0.02	0.26	1.00	0.67	-0.03	0.13	-0.01	-0.01
	Earnings per share	-0.23	0.17	0.87	0.63	-0.21	1.00	-0.14	-0.24
	Dividend per share	0.00	0.73	1.00	0.31	0.00	0.45	0.03	0.01
	P/E ratio	0.02	0.05	0.12	1.00	0.21	0.03	0.02	0.23
	Net assets per share	0.06	0.30	0.51	0.15	0.07	1.00	0.17	0.30

TABLE 3: Continued.

Registered address	Hangzhou	Nanjing	Changsha	Qinhuangdao	Ningbo	Huzhou	Yiwu	Nanjing	
Company name	Lianluo interactive	Focus technology	Anker innovations	Contec	Guangbo	Henglin	Huading	Tianze information	
Growth ability	Growth rate of main business income	0.04	0.00	0.15	1.00	0.01	0.14	0.22	0.45
	Growth rate of operating profit	-0.52	0.07	0.03	1.00	-1.70	0.04	-0.08	-0.34
	Growth rate of net profit	-0.86	0.08	0.03	1.00	-1.22	0.04	-0.15	-0.80
	Growth rate of net assets	-0.16	0.03	1.00	0.96	-0.12	0.05	0.15	0.14
	Growth rate of Total assets	-0.06	0.05	0.63	1.00	-0.07	0.13	0.12	0.14

TABLE 4: Correlation coefficient of secondary indicators of performance evaluation of 8 domestic A-share listed cross-border e-commerce export enterprises  $\beta_{ij}$  ( $\rho = 0.5$ ).

Registered address	Hangzhou	Nanjing	Changsha	Qinhuangdao	Ningbo	Huzhou	Yiwu	Nanjing	
Company name	Lianluo interactive	Focus technology	Anker innovations	Contec	Guangbo	Henglin	Huading	Tianze information	
Operational capacity	Efficiency of labor	1.00	0.59	0.82	0.62	0.61	0.59	0.65	0.63
	Turnover of account receivable	0.66	1.00	0.79	0.89	0.63	0.66	0.72	0.62
	Inventory turnover	0.62	1.00	0.59	0.59	0.62	0.61	0.60	0.59
	Turnover ratio of current assets	1.00	0.65	0.97	0.86	0.86	0.77	0.96	0.76
	Total asset turnover	0.81	0.63	1.00	0.75	0.77	0.70	0.76	0.70
	Current ratio	0.63	0.70	1.00	0.73	0.66	0.75	0.68	0.74
	Quick ratio	0.64	0.75	1.00	0.74	0.67	0.77	0.68	0.74
Solvency	Cash ratio	0.60	0.81	0.67	1.00	0.60	0.68	0.62	0.65
	Asset liability ratio	0.67	0.91	1.00	0.96	0.76	0.90	0.83	0.94
	Protection multiple of cash to interest	0.57	0.65	1.00	0.80	0.57	0.61	0.57	0.57
Profitability	Earnings per share	0.52	0.62	0.91	0.79	0.53	1.00	0.54	0.52
	Dividend per share	0.57	0.83	1.00	0.66	0.57	0.71	0.58	0.58
	P/E ratio	0.58	0.59	0.60	1.00	0.63	0.58	0.58	0.64
	Net assets per share	0.59	0.66	0.73	0.61	0.59	1.00	0.62	0.66
Growth ability	Growth rate of main business income	0.58	0.57	0.61	1.00	0.58	0.61	0.64	0.71
	Growth rate of operating profit	0.47	0.59	0.58	1.00	0.33	0.58	0.56	0.50
	Growth rate of net profit	0.42	0.59	0.58	1.00	0.38	0.59	0.54	0.43
	Growth rate of net assets	0.54	0.58	1.00	0.97	0.55	0.59	0.61	0.61
	Growth rate of total assets	0.56	0.59	0.79	1.00	0.56	0.61	0.60	0.61

TABLE 5: Correlation coefficient and ranking of primary indicators of performance evaluation of 8 domestic A-share listed cross-border e-commerce export enterprises.

Registered address	Hangzhou	Nanjing	Changsha	Qinhuangdao	Ningbo	Huzhou	Yiwu	Nanjing
Company name	Lianluo interactive	Focus technology	Anker innovations	Contec	Guangbo	Henglin	Huading	Tianze information
Operational capacity	0.310 1	0.275 3	0.298 2	0.259 5	0.253 6	0.240 7	0.267 4	0.240 8
Solvency	0.170 8	0.210 3	0.247 1	0.241 2	0.176 7	0.199 4	0.181 6	0.192 5
Profitability	0.069 8	0.080 4	0.101 2	0.101 3	0.071 6	0.107 1	0.071 7	0.073 5
Growth ability	0.119 7	0.136 5	0.161 2	0.232 1	0.113 8	0.139 3	0.138 4	0.134 6

TABLE 6: Grey correlation  $\theta_i$  and ranking of performance evaluation of 8 domestic A-share listed cross-border e-commerce export enterprises.

Registered address	Hangzhou	Nanjing	Changsha	Qinhuangdao	Ningbo	Huzhou	Yiwu	Nanjing
Company name	Lianluo interactive	Focus technology	Anker innovations	Contec	Guangbo	Henglin	Huading	Tianze information
Grey correlation	0.668	0.701	0.807	0.833	0.613	0.684	0.657	0.639
Sorting	5	3	2	1	8	4	6	7

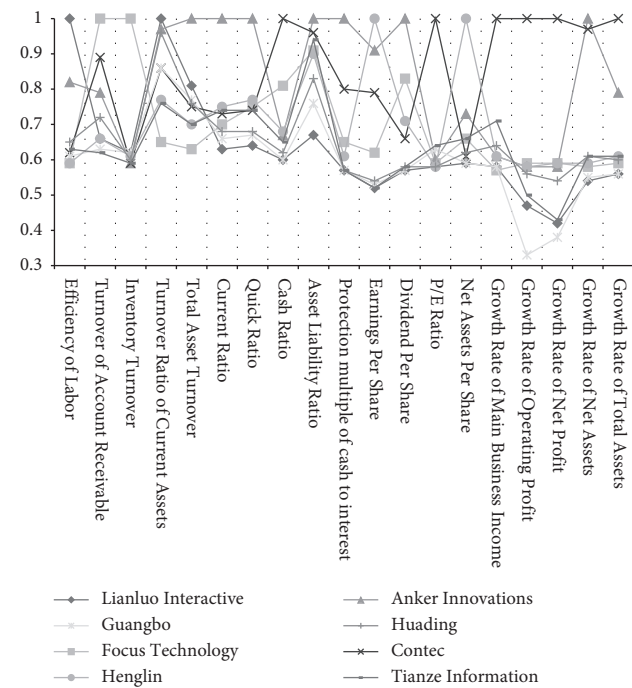


FIGURE 2: Line chart of correlation coefficient of 8 domestic listed cross-border e-commerce export enterprises.

**5. Conclusion**

According to the calculation results, Contec Medical Systems Co., Ltd. has the best performance, with the largest correlation coefficient in cash ratio, P/E ratio, main business growth rate, operating profit growth rate, net profit growth rate, and total assets growth rate, while the correlation coefficient of other companies in the same six

indexes has a big gap. However, according to the ranking of grey correlation of the four primary indicators, Contec Medical Systems Co., Ltd. ranks 5, 2, and 3, respectively, in terms of operational ability, solvency, and profitability, which is not ideal, but its growth capacity ranks first, with 44% more than that of Anker Innovations that rank second. Overall, this factor is the main reason for Contec Medical Systems Co., Ltd. having the best performance. Through further analysis, Contec Medical Systems Co., Ltd. has the main business of medical equipment, which is of its own brand. In recent three years, the growth rate of main business income, the operating profit growth rate, the net profit growth rate, and the total assets growth rate are very high, which are 261.84%, 775.84%, 731.37%, and 208.87%, respectively, mainly due to the positive influence of COVID-19 outbreak. Anker Innovations has the highest correlation coefficient in seven indexes: total assets turnover rate, current ratio, liquidity ratio, asset-liability ratio, cash-to-interest guarantee multiple, dividend per share, and net asset growth rate, ranking second, with the four primary indexes ranking 2, 1, 2, and 2, respectively. Anker Innovations has the main business of electronic products, which is of its own brand. Focus Technology ranked third in performance, with the largest correlation coefficient in the turnover rate of accounts receivable and the inventory turnover rate. The grey correlation of the primary index ranks 3, 3, 4, and 5, respectively. The channels of four cross-border platforms in export business are Made-in-China, CROV, inQbrands, and Doba. The correlation coefficient of earnings per share and net assets per share of Henglin is the highest, and the rank of grey correlation of the first index is 7, 4, 1, and 3, respectively. It has the main business is office tables and chairs, which are of its own brand. Guangbo Group Stock Co., Ltd. has the main business of stationery

products, which are of its own brand, and its rank of grey correlation is the last, which may be related to the negative influence of COVID-19 outbreak on the business, causing a large amount of online teaching; the other three companies ranked the last four, with a very low ranking among the correlation coefficients of four primary indicators and nineteen secondary indicators.

Generally, some domestic A-share listed cross-border e-commerce export enterprises in recent three years have their performance macroscopically affected by the COVID-19 outbreak, either positive or negative. Without this factor, such enterprises with excellent performance must be excellent and balanced in the four aspects of operation ability, solvency, profitability, and growth ability, and the operation ability and solvency are more important for domestic cross-border e-commerce export enterprises at present stage. The sequence of grey correlation of the primary index of Anker Innovations ranking second (ranking second for operating capacity, first for solvency) and of Focus Technology ranking third (ranking third both for operating capacity and solvency) properly illustrates this problem. Additionally, through analysis of the performance ranking of these eight enterprises, it is very important for domestic cross-border e-commerce export enterprises to choose their brands, multi-cross-border channels and traditional product portfolios for their main business [10].

Theoretically, the enterprise performance based on the hierarchy-grey correlation model is a relative good or bad, but according to the three principles of main business, physical transaction, and data availability, only these eight enterprises can represent the cross-border e-commerce export enterprises listed in domestic A shares, so it has absolute significance to some extent, which can provide reference for the management of other domestic enterprises at the present stage, and this kind of enterprises can also put their own data into this model to calculate and analyze, determine their own competitive advantages and disadvantages, and provide some ideas for the healthy development of enterprises. At the same time, it has certain reference significance for other types of e-commerce enterprises at home and abroad.

## Data Availability

The authors confirm that the data supporting the findings of this study are available within the article.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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