Analysis of Regional Logistics Industry Capability Assessment Model Based on DEA

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Abstract: Regional logistics is an important part of regional economic development. It evaluates regional logistics industry capabilities and establishes models to show the differences in development levels in different regions. Though modern logistics and traditional logistics functions are different, supply chain logistics management is taken as a business philosophy. Based on the analysis of regional logistics industry development capability, this paper proposes strategies for the development and optimization of logistics products and improves the investment methods of logistics industry, making the industry develop more rapidly.

1. Introduction

Regional logistics is the foundation of regional economic development and a reflection of the economic strength of different regions. Regional logistics refers to the embodiment of the comprehensive ability of the regional organization industry belt, including the effective use of logistics resources, the coordination of various factors around, and the goal of enhancing regional competitiveness. China's economy is developing rapidly, and building an efficient logistics system is of great significance to regional development. The establishment of DEA's regional logistics industry capability assessment model can evaluate the development indicators of logistics enterprises and provide a basis for industrial decision-making and development. Regional logistics planning has become an issue that the industry should face today. However, there are few regional logistics studies, and there are problems in the evaluation of various indicators. A unified and effective system and evaluation methods have not been formed. In this regard, DEA's regional logistics industry capability assessment model was established to further promote the development of the logistics industry.

2. DEA and regional logistics

DEA is data envelopment analysis's abbreviation, which is a systematic analysis method proposed by scholars in developed countries based on the theoretical basis of relative efficiency evaluation in China's reform and opening-up year. The DEA analysis method is the scope of operations research, using data planning, analysis, calculation, observation of data sample data, providing effective data support for decision-making, and solving multiple target problems within a certain range. The DEA method needs to ensure the unit fixation during the analysis process. Using mathematical analysis and statistics, project the DMU before the DEA, and using the comparison method, evaluate the degree of deviation and analyze the effectiveness of the decision.

Regional Logistics

Regional logistics is closely related to regional economic development. Regional logistics and regional economic development interaction and synergy. First, the synergy between regional logistics and regional economy. Secondly, it is the selection of indicators, using time and gray correlation to evaluate the logistics and economic development of a certain area, but most studies tend to the latter. Researchers use the data envelopment analysis method and the system to analyze the evaluation methods, and establish logistics development capability assessment models in different regions to make development and decision making more effective. Using the DEA evaluation method, the most typical C2R and C2GS can coordinate the analysis of regional logistics

and economic situation. The former model tends to unit decision-making synthesis technology, while the latter pay attention to achieve full coverage.

3. The role of DEA analysis method in regional logistics industry capability assessment

First of all, enterprise logistics belongs to a multi-level complex system. Different input and output units have complex relationships. Subsystems have connections, but they are not unified. The description process is difficult. The DEA analysis method effectively circumvents the intricate relationship, shows the relationship between different factors, and evaluates the object by effective frontier evaluation, and effectively evaluates the logistics capability. Secondly, the logistics cost of the enterprise logistics system and the poor performance of the customer indicate that a function in the process of obtaining benefits leads to the loss of other functional factors. The subsystem needs to have scale benefits, which will reflect the overall benefits. The DEA analysis method can reflect the scale of the logistics system and provide improvement suggestions for decision makers. Thirdly, in the evaluation of logistics industry capability, a number of indicators, such as financial indicators and non-financial indicators, have been adopted, but non-financial indicators have not established a unified quantitative evaluation system. There are differences in the indicators and dimensions, and there is no uniformity. The DEA analysis method does not need to think about these problems, and discards the relationship between the decision unit and the input and output unit, and directly processes the data indicators. Finally, the DEA analysis method gives the logistics industry the right feedback. The results of the DEA analysis method can be used to analyze the influencing factors of logistics technology, so that enterprises can take effective measures to solve and improve regional economic benefits, thereby promoting overall efficiency improvement. In the process of statistics, using the increase and decrease indicators to explore the changes in economic benefits, we will obtain the dependence of the indicators on the factors and effectively adjust the indicators.

4. DEA's regional logistics industry capability assessment model establishes the premise

The regional logistics structure has many levels of characteristics, including logistics entities and logistics objects and carriers. Different levels can reflect different functions and form an overall function. The logistics main body refers to the regional logistics market structure and organizational development level, which is the result of many behavioral leading effects, including the logistics enterprise, production enterprise and circulation enterprise. The regional logistics object refers to the logistics object, which belongs to the circular movement between the logistics entities. There are many types of logistics objects, and the number of logistics objects is different. Different logistics objects have different forms, different functions and structures, satisfying the use of different consumer producers, and logistics objects. With mobility, through the main activity organization, to provide demand to the main body, to achieve logistics functions. The regional logistics carrier is the basis for ensuring effective activities, involving railways, waterways and other aspects. The degree of perfection of regional logistics carrier systems is closely related to the level of regional logistics development. The regional logistics carrier system includes various parts such as airports, railways, highways, etc. Logistics equipment, regional logistics entities, objects and carriers jointly build the overall logistics, and determine the logistics category and scale.

In the development process of the logistics industry, a variety of complex indicators and systems are involved. Input and output indicators interact and interact, presenting intrinsic relationships and cannot be reflected from a microscopic perspective. Therefore, the function equations cannot be used to express the input and output relationships. There are differences in the importance of various indicators of the development capability of the logistics industry. Decision makers will analyze the evaluation indicators according to their own subjective factors. Therefore, subjective and objective can be combined in evaluating the development ability of the logistics industry. The DEA method can be based on a macro perspective. Demonstrate the development capability of the logistics industry. This method has certain dependence on input and output indicators, but it can evaluate the relative efficiency of different organizations from an objective perspective. During the

analysis process, it is not necessary to establish a function for all data. When measuring the efficiency of several units, focus on The relevant units are planned to derive the maximum efficiency and the results have the best characteristics. The DEA analysis method can effectively measure the complexity of different units in the logistics market, and explore the limitations of DEA itself, reflecting the focus of decision makers on different indicators. The application of this method will make the analysis of logistics industry problems more targeted. The result is accurate. In the process of establishing the evaluation system, the target area should be set up, and four types of indicators, fixed assets investment, current assets investment, labor input, and market size should be input. The output indicators need to have three items, which are the total value of the logistics industry's profits, the total value of the logistics industry, and the proportion of logistics in GDP. These indicators can ensure that the construction of the evaluation system is more complete, coverage, accuracy and independence requirements. According to the construction of the input system, the data is collected to determine various indicators. In order to fully reflect the development of the logistics industry, it is necessary to select historical data to evaluate the industry dynamics.

5. DEA's regional logistics industry capability assessment model establishment method

The DEA basic model is set to C2R and C2GS. The former is mainly for technical validity and scale effectiveness. The latter is to indicate the effectiveness of the evaluation technology. Therefore, in the process of capacity assessment of the logistics industry, the first evaluation method should be selected to ensure coverage. The principle of DEA analysis method is the basis for establishing the model. If the development of logistics industry is set through n stages, this stage is called DMU. There are different input indicators and output indicators in different stages. It is assumed that X and y represent input and output indicators of individual stages. In the process of evaluating the model construction, there are n decision-making units, as shown in Table 1.

Table 1 decision input and output unit representation

Level	Input	Input element				Output element				Output
1	V1	X10	X11	X12	X13	Y10	Y11	Y12	Y13	U1
2	V2	X20	X21	X22	X23	Y20	Y21	Y22	Y23	U2
3	V3	X30	X31	X32	X33	Y30	Y31	Y32	Y33	U3
n	Vn	Xn0	Xn1	Xn2	Xn3	Yn0	Yn1	Yn2	Yn3	Un

In Table 1, V1 represents the metric of the i input type, Ur represents the input unit metric of the rth type, and i can represent 1, 2, 3, 4, n, r = i = j. If Xij and yij represent units that are already known, the unit can be predicted based on the relevant data, so that vij and uij represent variables. The corresponding weight vector is represented by V=(v1, v2,...)T, and U=(u1, u2,...)T represents that the efficiency of the J decision unit is defined as:

$$h = \frac{\sum_{u-1}^{4} U_i Y_{1i,}}{\sum_{i-1}^{4} V_i X_u} \quad j = 1,2,3,...n$$

After determining the relative efficiency of the first decision unit, set the output index weight coefficients v and u as variables. After all the decision conditions are satisfied, the efficiency is below 1, and the efficiency of the decision unit needs to take the maximum value. This value is also called the decision unit. Relative efficiency. Therefore, the following DEA model can be constructed.

$$\max \frac{\sum\limits_{r-1}^{4} ur yr j0}{\sum\limits_{i-1}^{4} ur yri} \leq VD \qquad s.t. \frac{\sum\limits^{4} ur yri}{vi xij} \leq 1$$

Note: ur ≥ 0 r = 1, 2, 3, 4;
Vi≥0 i=1,2,3,4;
If chames cooper is 0:t1/vTX0, w=tv, u=tu; the above fraction is transformed to form a linear programming couple function:

$$\min \theta = VD$$

$$s.t. \sum_{j-1}^{n} \lambda j xj + s\_ = \theta x0$$

$$\sum_{j-1}^{n} \lambda i yi - s+ = y0$$

In the above formula, j = 1, 2, 3, 4, ... n; $S+ \geq \varepsilon$.

Assume that Archimedes is infinitesimal, indicating the weight coefficients of the input and output, and the optimal solution can be planned as S_, S+,. If =1. and S_=0, S+=0, linear programming theory analysis can be used. DMU is effective in DEA analysis. If 0<<1, it means that DMU is effective in nonlinear programming DEA. If the value expressed is small, the effectiveness is reduced. If j is valid in the nonlinear programming DEA, then xj can be expressed as xj-S_, and when yj is expressed as yj-S+, the unit is converted to DEA, and the conclusion is that the DMUJ projection value is (xj-S_, yj -S+). Through the above calculations, the quantitative input of different decision-making units will be clearly observed. In the process of development, the logistics industry can evaluate the development capability and propose corresponding reform measures. The DEA method combined with other methods can more fully observe the operation of the logistics industry at different stages. Using the combination of multiple regression and AHP factors, it is possible to clarify the impact of different factors of the logistics industry on development, so as to explore the development of the logistics industry more effectively, and adopt a continuous dynamic comparison method with other methods to conduct a comprehensive analysis. The result can be the logistics industry. The development provides a path, adjusts the industrial structure, clarifies the development of logistics economy in different regions, and adopts effective measures to improve the regional logistics operations and provide a scientific basis for decision-making.

6. Conclusion

The establishment of DEA's regional logistics industry capability assessment model can clarify the situation of logistics development in different regions. Observing the weak project index and nonlinear and linear programming functions will help logistics decision makers to make effective decisions. Analyze the relationship between regional logistics structure and regional economy, follow the concept of economic theory, effectively analyze the relationship between supply and demand, and promote regional economic development, so that the logistics industry can follow the development of the times, choose the correct business philosophy, change the previous operating status, and realize the enterprise. Economic benefits guarantee the rapid development of enterprises.

Acknowledgments

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