The Analysis of Automobile Enterprises Based on Outsourcing

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Abstract. The Automobile Logistics Enterprises plays an important role in enhancing core competition strength of an enterprise, improving added-value service, reducing cost of logistics and optimizing enterprise resources etc., but whether the above aims can be achieved depends on the ability and service of logistics vendors. It is of critical importance to the success of enterprise's outsourcing to choose an appropriate Automobile Logistics Enterprises vendor. While currently in China, the evaluating method we adopt are relay on analyzing the financial guideline of Automobile Logistics Enterprises evaluated by experts so as to ensure the final Automobile Logistics Enterprises. This method is not only too objective but also dissevers the connection between the biddings. Based on the construction of the index system for Automobile Logistics Enterprises classification, a method of classifying Automobile Logistics Enterprises is presented in this paper applying the cluster method of multivariate statistical analysis. It can be regarded as an important method for classifying Automobile Logistics Enterprises. Moreover, this method not only conquers the above drawbacks but also contributes to the selection of the Automobile Logistics Enterprises vendors on the basis of some objective information provided by this method.

Introduction

So-called Logistics Outsourcing, namely production or sale enterprises centralize energy to enhance core competition, but operates its logistics business by the contract way which operated by the specialized Logistics company, this kind of outsourcing is the service which is a kind of long-term, strategy, interaction, mutual benefit and reciprocity. Outsourcing is widely regarded as a most effective means to reduce the operation cost and enhance the competitiveness of the businesses, especially since 1980’s and 1990’s which witnessed the fast development of outsourcing in the supply chain of the logistics industry and the emergence of an important trend towards engaging the supplier of the logistics service in relevant logistics practice. For our country logistics industry is being at the start stage, further research is not enough to its theory and method and the content of choosing and evaluating Automobile Logistics Enterprises to be less[1]. Now, the problem has been further studied by many literatures but the comprehensive quantitative analysis about Automobile Logistics Enterprises is less.

The classification of Automobile Logistics Enterprises overall and objectively brought many advantages for the subsequence cooperation between the Automobile Logistics Enterprises and enterprises, promoted the entire Automobile Logistics Enterprises industry development. Conversely, the smooth development of Automobile Logistics Enterprises may promote demand enterprises to higher level and form virtuous circle and then industry cooperation and society economy development. So, the study of Automobile Logistics Enterprises evaluation ways and model bear theory and practical significance, regardless of Automobile Logistics Enterprises and other enterprises. Logistics outsourcing is an important ache to assess and select Automobile Logistics Enterprises justly and equitably in the outsourcing process of enterprises. And whether an appropriate Automobile Logistics Enterprises vendor choose has become the key to enhance the core competence, low logistics cost, optimize inside and outside resource but whether above aims can be achieved depends on the ability and service of logistics vendors. It is of critical importance to the success of enterprise's outsourcing to choose an appropriate Automobile Logistics Enterprises vendor.

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However, the evaluations currently are carried out by the evaluators manually through analyzing the financial indices of the third party logistics, which not only is too objective but also break the relevancies among the indices. The index system used to evaluate the business features of the third part logistics is constructed. A quantitative approach is adopted to assess the third part logistics through cluster method of multivariate statistical analysis. The method can be regarded as an important method for classifying Automobile Logistics Enterprises. Moreover, this method not only overcomes the above drawbacks but also contributes to the classification of the Automobile Logistics Enterprises vendors on the basis of some objective information provided by this method.

This paper analyzes the cause of enterprise logistics outsourcing, and build the evaluation indices of logistics outsourcing. The quantitative analysis method is applied to evaluating logistics service and the satisfactory results are obtained.

Mathematics Model and Calculation Process
Cluster analysis is the method of multivariate statistical analysis, which study the things Classification, according to the principle of “Like-minded people grouped”. Based on the multi-index value of a group of samples, it can concretely find Statistic which can measure the similar degree of samples and then take as foundation to decide what type. The distant samples be congregated a big taxonomical unit and the consanguineous be gathered to a small taxonomical unit. So the different types be divided in detail. at last, the pedigree figure of ward cluster is came into being which can reflect the difference and relation of object divided (samples and variable) and samples have same similar characters in the same group. Cluster analysis can be divided two types: Q type cluster analysis and R type cluster analysis. The foundation of Q type cluster analysis is samples cluster and the foundation of R type cluster analysis is index cluster. The paper aim to cluster sample so select Q type cluster analysis [2] [3] [4] [5] [6].

The Evaluation Case Analysis of Automobile Logistics Enterprises
Automobile Logistics Enterprises Evaluation Index and Data
The logistics outsourcing side must decide that needs how many third party logistics provider choised which provide the logistics service for company. According to the profession characteristic and enterprises own demand, which are clear to third party logistics business request and formulate third party logistics choice standard. In order to assess and value automobile logistics, this paper scores and orders the automobile logistics by the following guidelines: (1) Sales net profit rate F1; (2) Sales gross profit rate F2; (3) Accounts receivable turnover ratio F3; (4) Inventory turnover F4; (5) Total assets turnover ratio F5; (6) Operating cycle F6.
Through open information, this paper collect eleven automobile logistics annual finance data publicized, and then gain eleven simple original data in comprehensive evaluation index system. This paper using the most authority software SAS, combining the cluster method of multi-statistics analyzes and assesses twelve automobile logistics firstly. Using the SAS software to analyze the original data collected, which could be ordered to the combining process table of the ward method and the figure of pedigree. The enterprises in this case are Jiangling Motors Co., Ltd., Tianjin FAW Xiali Automobile Co., Ltd., FAW Car, Jinan Truck Co., Ltd., Dongfeng Motor Corp., Shanghai Automotive Co., Ltd., Changchun FAW Sihuan Automobile Company Limited, Chongqing Changan Automobile Co., Ltd., AnHui Ankai Automobile Co., Ltd., AnHui Jianghuai Automobile Co., Ltd. JiangXi ChangHe Automobile Co., Ltd., AnHui XingMa Automobile Co., Ltd. and their full names will be represented by c1-c12.
There be three type of index: (1) Positive index, the more value the more practice production. (2) Negative index: the more value the less practice production. (3) Moderation index: the value in the best course denote the best level. Different type index want adopt different ways in the process of
non dimension in order to possess the attribute of positive index. Formula adopted: negative
index $x'_i = 1 - x_i$; moderation index: $x'_i = \frac{1}{|x_i - \bar{x}|}$

**Evaluation Principle**

R2 Statistic. N samples be divided into k types and marked as G1, G2, ..., Gk, nt denote the number of Gt type ($n_1 + ... + n_k = n$), $\bar{X}^{(i)}$ denote the barycenter of Gt, $\bar{X}^{(i)}$ denote i samples in G (i=1,...,nt) $\bar{X}$ denote the barycenter in all samples, the dispersion sum-of-squares nt samples in Gt type

$$w_i = \sum_{i} (X_{i(i)}^{(i)} - \bar{X}^{(i)})'(X_{i(i)}^{(i)} - \bar{X}^{(i)})$$

$$R^2 = \frac{B_k}{T} = \sum_{i} \sum_{j} (X_{i(j)}^{(i)} - \bar{X}^{(i)})'(X_{i(j)}^{(i)} - \bar{X}^{(i)}) B_j = \sum_{i} s_i (\bar{X}^{(i)} - \bar{X})'(\bar{X}^{(i)} - \bar{X})$$

The bigger R2 value, which means the bigger proportion Bk account for T, the better k types can be distinctly divided. Bk is deviation sum-of-squares in k type, we adopt R2 Statistic to evaluate the cluster effect when samples be merged into k type. The bigger R2, the better cluster effect.

Semi-partial R2 statistic.

$$R^2 = \frac{B_k}{T} = \sum_{i} \sum_{j} (X_{i(j)}^{(i)} - \bar{X}^{(i)})'(X_{i(j)}^{(i)} - \bar{X}^{(i)})$$

$$B_k = B_{K\cup L} - (B_k + B_L)$$

In which, $B_{K\cup L} = W_k - (W_k + W_L)$ denote the increment when GK and GL was merged into new GM type, which can evaluate the combination effect. The thing that semi-partial R2 value become bigger in some step show previous step cluster effect is better.

Pseudo F Statistic. Pseudo $F_i = \frac{(T - P_i)(K - 1)}{P_i(n - k)} = \frac{B_k n - k}{P_i k - 1}$ This Statistic can evaluate the cluster effect of the samples which divided into k type. The bigger Pseudo Fk value get, the better n samples be divided into k type.

Pseudo t2 Statistic. Pseudo $t^2 = \frac{B_k}{W_k + W_L} \frac{n_k + n_L}{n_k + n_L - 2}$ This Statistic can evaluate the effect of GK and GL combination type, the bigger value means the dispersion sum-of-squares increment $B_{K\cup L}$ is bigger compared with GK and GL. GK and GL are incorporated into GM and the GM dispersion sum-of-squares is $B_{K\cup L}$, so this prove the formal cluster is efficient[7][8][9][10][11].

**The Evaluation Process**

This paper using the most authority software SAS, combining cluster analyzing method of multi-statistics analyzes and assesses twelve Automobile Logistics Enterprises. Using C1-C12 to represent twelve Automobile Logistics Enterprises. Using the SAS software to analyze the original collected data [12][13], which could be ordered to the combining process table of the ward cluster method and the figure of pedigree. The table and figure as follows:

According to table 1, R2 Statistic (row title RSQ) can evaluate the cluster effect when samples be incorporated NCL type. The bigger R2 value we get, the better cluster effect we get. The R2 value is between 0 and 1 and become smaller with NCL number decrease. From the table, we can see the decrease of R2 value is gradual and little in the combination process before 3 type (NCL>3), when be divided 3 type, R2=0.792, when the next be combined 2 type, R2 decrease obviously, R2=0.663. Based on analysis above, we can draw a conclusion that 3 type is suitability. According to semi-partial R2 principle (SPRSQ), the biggest and bigger semi-partial R2 is NCL=1, 2 and 3, so samples incorporated into2, 3 or 4 type is suitability. According to Pseudo F principle (PSF), the biggest and bigger Pseudo F is NCL=2, 3 and 4, o samples incorporated into 2, 3 or 4 type is suitability. According to Pseudo t2 principle (PST2), the biggest and bigger Pseudo t2 is NCL=1, 4 and 2, o samples incorporated into 2, 5 or 3 type is suitability.
Based on analysis above, contractors divided 3 type is suitability. The final result is $G_1(3) = (C_1, C_3, C_5, C_7, C_2, C_4, C_8, C_6)$, $G_2(3) = (C_10)$, $G_3(3) = (C_9, C_{11}, C_{12})$. From analysis above, we can see that the Automobile Logistics Enterprises can be classified into three groups, different type means different level and ability.

Table 1. The ward cluster process

<table>
<thead>
<tr>
<th>NCL</th>
<th>Clusters Joined</th>
<th>FREQ</th>
<th>SPRSQ</th>
<th>RSQ</th>
<th>ER.SQ</th>
<th>CCC</th>
<th>PSF</th>
<th>PST2</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>c5, c7</td>
<td>2</td>
<td>0.0032</td>
<td>.997</td>
<td>.</td>
<td>31.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>c4, c8</td>
<td>2</td>
<td>0.0060</td>
<td>.991</td>
<td>.</td>
<td>24.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>c11, c12</td>
<td>2</td>
<td>0.0077</td>
<td>.983</td>
<td>.</td>
<td>21.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>c1, c3</td>
<td>2</td>
<td>0.0107</td>
<td>.973</td>
<td>.</td>
<td>20.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CL8, CL11</td>
<td>4</td>
<td>0.0190</td>
<td>.954</td>
<td>.</td>
<td>17.1</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CL7, c2</td>
<td>5</td>
<td>0.0267</td>
<td>.927</td>
<td>.</td>
<td>15.2</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>c9, CL9</td>
<td>3</td>
<td>0.0269</td>
<td>.900</td>
<td>.</td>
<td>15.7</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CL10, c6</td>
<td>3</td>
<td>0.0445</td>
<td>.855</td>
<td>.</td>
<td>15.8</td>
<td>7.4</td>
<td></td>
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<tr>
<td>3</td>
<td>CL6, CL4</td>
<td>8</td>
<td>0.0633</td>
<td>.792</td>
<td>.</td>
<td>17.1</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CL3, c10</td>
<td>9</td>
<td>0.1293</td>
<td>.663</td>
<td>.629</td>
<td>0.40</td>
<td>19.7</td>
<td>5.2</td>
</tr>
<tr>
<td>1</td>
<td>CL2, CL5</td>
<td>12</td>
<td>0.6628</td>
<td>.000</td>
<td>.000</td>
<td>0.00</td>
<td>.</td>
<td>19.7</td>
</tr>
</tbody>
</table>

Conclusions

The classifying of Automobile Logistics Enterprises vendors is crucial link of enterprise outsourcing. In practice, being short of right classifying methods lead to both sides difficult to work together effect. The comprehensive theory basis of the cluster method is one of the most important methods in multi-statistics. This paper takes the basics on the system of constructing Automobile Logistics Enterprises’ valuation standard, and applies the cluster method to assess the Automobile Logistics Enterprises. The analysis result can be regarded as one of main foundations for reference.

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