

Study on the Economic Competitiveness Evaluation of Coastal Counties: Example as Liaoning Province

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Abstract. The competitiveness of coastal county is an important area of study on regional competitiveness, and evaluation study on county economy is important basis and foundation to improve the competitiveness of coastal county economy. Based on a brief description of literature review, a method based on stakeholders' perspective is proposed to solve the competitiveness evaluation problem. In addition, the effectiveness of the proposed method is illustrated by the example as Liaoning province. Finally, some countermeasures are proposed to promote coastal county economy according the evaluation result and characteristics.

Introduction

Due to convenient transportation conditions for international trade, coastal counties get prosperity for trading with the world and will be easy to form manufacturing bases for processing trade. Many scholars are attracted to the research of economic competitiveness evaluation for its widely application background. Liu(2013) established evaluation index system of county economy for Tangshan, and proposed a method for county economy evaluation based on factor analysis [1]. He(2014) designed evaluation index system based on the perspective of economy development demand in county level, and analyzed the supporting ability of science and technology in Anhui by means of analytic hierarchy process(AHP) [2]. Above mentioned methods have each superiority, but evaluation results rely too much on experts' preference. Evaluation objects are considered as passive objects in the above evaluation problems, while evaluation objects always have more complete evaluation information. In order to highlight the democracy of evaluation process and make full use of evaluation information of the object itself, many scholars proposed new methods [3, 4, 5]. Yi(2007) proposed a multi-attribute decision-making method indicating self-determination, which is based on weights non-dictatorship and competitive view optimization principle [6]. Li et al. (2012) proposed an objective self-determining evaluation method based on collaborative perspective, which can be used to solve interval number comprehensive evaluation problem [7]. Based on the models above, a method based on stakeholders' perspective is proposed to solve the competitiveness evaluation problem of Liaoning province.

Evaluation Model

Classic bargaining evaluation method is based on a multi-index evaluation system with evaluation object $O=(o_1, o_2, \dots, o_n)$ and evaluation index $X=(x_1, x_2, \dots, x_m)$. The index observed value $x_{ij} = x_j(o_i)$ ($i=1, 2, \dots, n; j=1, 2, \dots, m$) is objective existence, and an $n \times m$ observed value matrix A can be

constructed as follows: $A=[x_{ij}]_{n \times m} = \begin{bmatrix} x_{11} & x_{12} & L & x_{1m} \\ x_{21} & x_{22} & L & x_{2m} \\ M & M & M & M \\ x_{n1} & x_{n2} & L & x_{nm} \end{bmatrix}$. Let y_i be evaluation value of o_i , and the

credible degree of comprehensive evaluation results is directly relates to the index weight.

We know that if one row vector is closely to another one in evaluation matrix A , then the two evaluated objects could have more common interests. Based on the aforementioned analysis, we give definition of benefit correlation coefficient from the view of proximity of vector.

Definition 1: Let $r_{ii'}$ be benefit correlation coefficient between evaluated object o_i and evaluated object $o_{i'}$, and benefit correlation coefficient is given by

$$r_{ii'} = x_i \cdot x_{i'} / (\|x_i\| \cdot \|x_{i'}\|), i, i' = 1, 2, \dots, n \quad (1)$$

Where $x_i = (x_{i1}, x_{i2}, \dots, x_{im})$ is the row vector of matrix A , and $\|x_i\|$ is the norm of x_i . If the data of matrix A has been normalized, then $r_{ii'} \in [0, 1]$. By definition 1, we know that the bigger the $r_{ii'}$ is, the more benefits evaluated objects get from the cooperation.

Definition 2: Let $c_{ii'}$ be net benefit coefficient between evaluated object o_i and evaluated object $o_{i'}$, and net benefit coefficient is given by

$$c_{ii'} = r_{ii'} - (1 - r_{ii'}) = 2r_{ii'} - 1 \quad (2)$$

The Eq. 2 represents net benefit between evaluated object o_i and evaluated object $o_{i'}$ if they cooperate with each other. Obviously, $c_{ii'} \in [0, 1]$. When $c_{ii'} > 0$, cooperation between evaluated object o_i and evaluated object $o_{i'}$ does not more harm than good. When $c_{ii'} = 0$, cooperation brings same pros and cons. When $c_{ii'} < 0$, cooperation does more harm than good, and evaluated object o_i is a competitor for evaluated object $o_{i'}$.

Suppose each evaluated objects as independent agents, then they want to highlight their own advantages and maximize their own interests as much as possible. In general, each stakeholder has some similar advantages, thus when an evaluated object highlights advantages of stakeholders, it also highlight its own advantages. So we suppose that each evaluation subject not only try to highlight its own inherent advantages, but also take advantage of the stakeholders to expand their advantage as much as possible.

According to the assumption that we can obtain calculation model of index bargaining weight by

$$\max \sum_{i=1}^n c_{ii'} \sum_{j=1}^m x_{ij} w_j^{(i)} \quad (3)$$

where $w_j^{(i)}$ is index weight value from the perspective of evaluated object o_i .

By literature [8], the index weight and evaluation value can be determined.

Application of the Evaluation Model

According to the literature [9], the evaluation indices and evaluation objects can be determined, and the evaluation index value can be obtained by literature [10]. In this case, there are six evaluation indices: gross regional domestic product (x_1), total income of public Finance & Budgeting (x_2), total retail sales of consumer goods (x_3), total export (x_4), incoming overseas capital in place (x_5), and gross fixed asset formation (x_6). The date unit of x_1, x_2, x_3, x_6 are ten thousand yuan, and the date unit of x_4, x_5 are ten thousand dollar. There are twenty-three coastal counties: Ganjingzi (o_1), Lvshunkou (o_2), Jinzhou (o_3), Changhai (o_4), Wafangdian (o_5), Pulandian (o_6), Zhuanghe (o_7), Zhenan (o_8), Donggang (o_9), Bayuquan (o_{10}), Laobian (o_{11}), Gaizhou (o_{12}), Dashiqiao (o_{13}), Shuangtaizi (o_{14}), Xinglongtai (o_{15}), Dawa (o_{16}), Panshan (o_{17}), Taihe (o_{18}), Linghai (o_{19}), Lianshan (o_{20}), Longgang (o_{21}), Suizhong (o_{22}), Xingcheng (o_{23}). The index data is shown in Table 1.

According to the evaluation model, the comprehensive evaluation result can be obtained, $y = [y_1, y_2, \dots, y_n] = [0.339, 0.133, 0.597, 0.010, 0.357, 0.238, 0.206, 0.034, 0.161, 0.182, 0.116, 0.094, 0.139, 0.022, 0.215, 0.276, 0.140, 0.039, 0.121, 0.077, 0.045, 0.087, 0.085]$. The economic competitiveness rank of coastal counties is shown in Table 2.

Table 1 Related economic data of coastal counties in 2014

	x_1	x_2	x_3	x_4	x_5	x_6
o_1	9635337	475311	7895253	4639753	102600	449935
o_2	2840156	355196	4226611	690132	38550	120001
o_3	16611661	1034143	15435839	3798479	429000	1013034
o_4	892955	48123	502047	135491	11000	826
o_5	10227642	728145	10849284	1860463	202421	64500
...
o_{23}	1281312	135000	716707	12000	11014	1506825

Table 2 The economic competitiveness rank of coastal counties

coastal counties	rank	coastal counties	rank	coastal counties	rank
o_1	3	o_9	9	o_{17}	10
o_2	12	o_{10}	8	o_{18}	20
o_3	1	o_{11}	14	o_{19}	13
o_4	23	o_{12}	15	o_{20}	18
o_5	2	o_{13}	11	o_{21}	19
o_6	5	o_{14}	22	o_{22}	16
o_7	7	o_{15}	6	o_{23}	17
o_8	21	o_{16}	4		

Conclusion

The paper introduced the ideas of self-determining evaluation to economic competitiveness evaluation problem, and the method can reflect the subject status of each coastal county. According to the evaluation result, Jinzhou, Wafangdian and Ganjingzi develop better, and the other coastal counties still have resistance to enhance economic power, they urgently need operational measures to improve economic competitiveness.

First, each coastal county should promote structural adjustment of agricultural supply, build national modern agricultural demonstration zone, and develop green agriculture, circular agriculture, characteristic agriculture and brand agriculture.

Second, each coastal county should strengthen agricultural scientific and technological innovation, promote agricultural mechanization, prevention-control animal and plant diseases at their source.

Third, each coastal county should build specialized industrial base and agricultural products processing base, improve the level of marketization of coastal counties.

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