Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2014, 6(3):755-763

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

The study of sports industry competitiveness of six provinces in Central China based on entropy weight and TOPSIS integration

Chen Qizheng[1], He Hui[2], Liu Bolin[2], Wang Peng[2] and Zhang Shuchang[3]

[1]*Military Sports Teaching and Research Department, Jilin Agricultural University, China*
[2]*Military Common Subject Teaching and Research Section in the Department of Basic Courses, Dalian Airforce communication NCO Academy, China*
[3]*Sport Department, Jilin Business and Technology College, China*

ABSTRACT

Since the twenty-first Century, the sports industry is heavier in the national economy proportion and with the implementation of the rise of central China strategy. The strategic position of the central region has been raised to the highest level in history. Therefore, research on sports industry competitiveness of six provinces in central China, not only can know the development of sports industry in the future, but also can better understand the central six provinces` forward direction under the of strategy "revitalize the national sports economy". Based on the previous research, entropy weight and TOPSIS integration algorithm as data mining method, collect the middle six province sports industry data, then evaluate the competitiveness of sports industry in six provinces in central China.

Key words: Sports industry competitiveness, entropy, TOPSIS integrated, data mining

---

INTRODUCTION

Since 2006, the State Council promulgated the "CPC Central Committee and the State Council several opinions on promoting the rise of central China". National Development and Reform Commission according to the views of the spirit compiled "planning" to promote the rise of central China in 2009 to June."Planning" emphasized, to cultivating new economic growth point. [1]

In recent years, the sports industry has become an important support for economic development in developed countries,Chinese sports industry has attracted more attention from the government and all walks of life,and “The sports industry revitalization planning" has aroused the enthusiasm for sports industry, the sports industry as a new growth point of national economy in low carbon era. Therefore, we can say that, to some extent, the development of the sports industry drives the central six provinces and the country's economic development.

On the other hand, the sports industry is a value creating industry by its own function and radiation function [2].

It includes two parts of sports goods and sports service, specifically including: the sporting goods industry, fitness and entertainment industry, sports industry, sports intermediary industry, sports lottery, sports tourism, sports media, sports insurance etc, is an important part of the national economy [3].

And because of its enormous role in the radiation,although the sports industry scale is limited, it cannot be ignored that the sports industry plays an important role in promoting national economic and national quality.Data shows, the annual output value of the sports industry in the world in 2000 is about $400 billion, and an annual growth rate of 20%.In North America, Western Europe and Japan sports relatively developed countries and regions; the annual output value of the sports industry has entered the ten big industries [4].

USA is the most developed country in the world of sports industry, according to statistics, in 80`s; American sports industry output value accounts for only about 1% of GDP, In each big industry output ranked 22, while the 1988 sports value has reached 63.1 billion U.S. dollars, more than oil industry, automobile industry, has accounted for 1.3% of GDP. But by the late 90's, the sports industry has accounted for GDP of 2%, ranking soared to eleventh. In developed countries, Australia, Canada, Japan, Britain, Germany, France, Italy, etc. sports industry output value generally accounted GDP between 1%-1. 5%. [5]

From the sports consumption situation,in 1995, American participating in the leisure sports and watching sports events such as the expenditure of $44.173 billion, for the purchase of sports services and goods spending accounts for the largest proportion of sports consumption,America has 33% of the families have fitness equipment.In 1999, Japanese annual average family sports consumption wasmore than 80000 yen, in 1996, the average of Canadian family sports consumption is $718 [6];

According tothe General Administration of Customs in 2009 can belearned, in 2008 Chinese sport goods exports totaled $7.88 billion, in 2009,has reached $14.5 billion. [7]

In the world cup in South Africa, Chinese manufacturing "WuwuZula" isintuitively explained our country sports activities have played a certain role in the world.

However, as a sunrise industry, strong vitality and immature features are also present in the sports industry. Such as: industrial enterprises mainly are small or medium enterprises, positioning of sports enterprises are very fuzzy,and lack of its own product positioning. Chinese sports industryenterprises cannot form their own core competitiveness. Therefore, combing the sports industry competitiveness evaluation criterion has become the focus of academic research.

In 1966 Vernon presented the theory of the product life cycle,scholars research focus on the actual situation of how to deal with the diversification of market demand and product cycle [8].

Gort and Klepper divide the industrial development stage for the introduction, into large, stable, a lot of exit and the 5 stages of maturity, established the first industry life cycle model of industrial economics [9].

American scholar Michael Potter's "Diamond Model" is the most acknowledged by domestic and foreign scholars in the evaluation of industrial competitiveness [10]. Dependingon this theory, competitiveness of some industry mainly depends on six factors, production factors, demand conditions, related and supporting industries, firm strategy, structure and competition, opportunity and government.Among them, the first four are the key elements, after two are the auxiliary factors.

The British scholar Denning (Dunning) proposed "the Potter Denning model".According to this theory, Multi-National Corporation's business activities will be directly or indirectly affect the elements in the diamond model,so the Multi-National Corporation's business activities should be the thirdexogenous variables and added to the model of Potter. [11]

In 1994, scholar Zhao Dongcheng has expanded the"diamond model". [12]

But in our country, scholars argue that the use the theory of comparative advantage, help to explore the comparative advantage and the development of the sports industry, to provide new ideas for the development of national overall sports industry and regional sports industry development strategy. [13-16]

Xu Yanfang et al proposed two main identifying paths for comparative advantage: one way is to start from the factor endowment, two is the market competition determine what comparative advantage is. [17-19]

Xia Congde constructs the index system for evaluation and comprehensive evaluation system of sustainable development of competitive sports in China. [20, 21]

Zhao Hengmin, Zhang Tieling discusses the construction of sports social assessment system. [22, 32]

Read the above information may be found, although domestic and foreign scholars have conducted extensive researchon sports industry competitiveness, but few have done by a mathematical model, so its research results lack of rigor. Therefore, on the basis of previous studies, this paper selected six provinces of Central Sports industry to study, using entropy weight and TOPSIS integration algorithm methodto data mining, carries on the evaluating to the middle six province sports industry,to promote the development of sports industry.

This paper is structured as follows:
The first section, the research in the sports industry and sports industry competitiveness is briefly introduced.
In section second, the entropy theory and application.
The third section, the relevant theory and application of TOPSIS.
The fourth section, use entropy and TOPSIS are integrated to evaluate sports industry competitiveness in six provinces in central China.

The research steps are showed in figure 1.

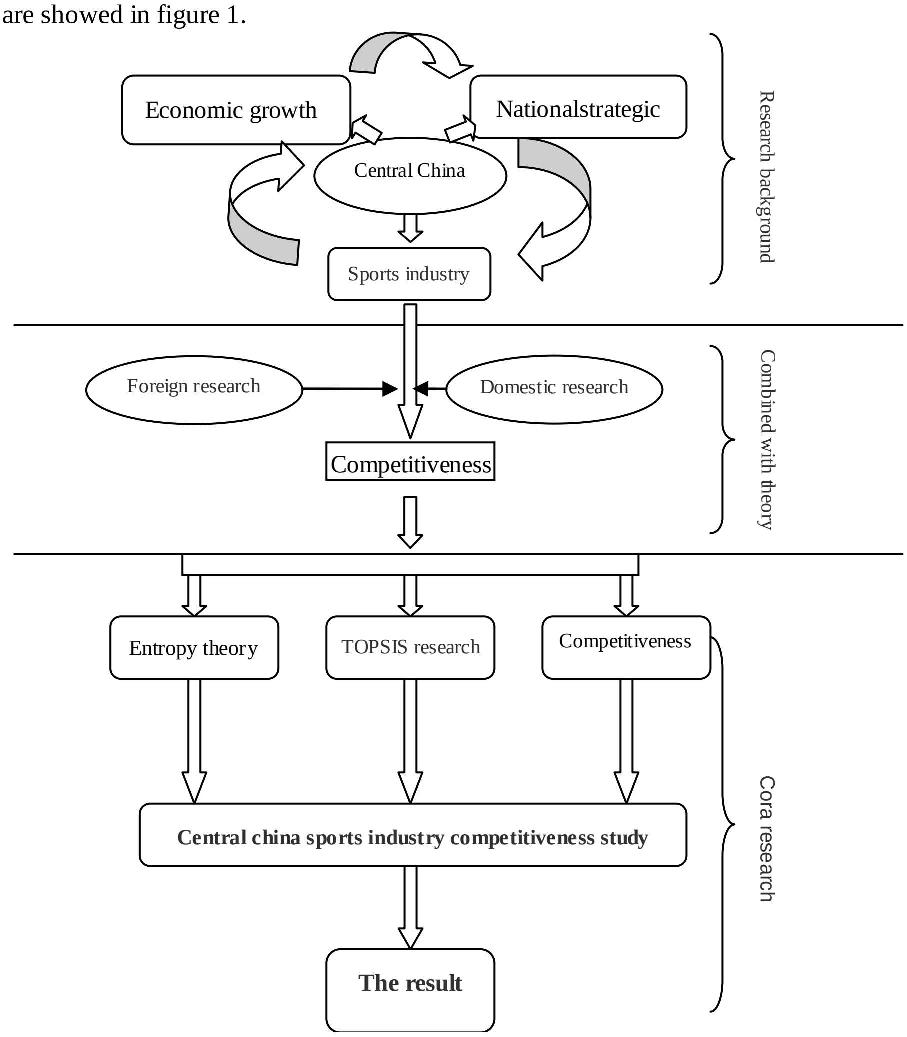

Figure 1. Research steps

ENTROPY WEIGHT

In the ordered three tuple $R=\{N_1,c,v\}$ as the basic element to describe things, referred as the matter element.Among them, N says things; c as the feature name; v the value of N about c ,the three as the three elements of matter element.In the concept of matter element, $v=c(N)$ reflects the quality and quantity of things, c and v formal features,one thing with many characteristics, is described by the n-dimensional element:

$$R=\begin{bmatrix} & c_1 & v_1 \\ N & c_2 & v_2 \\ & \vdots & \vdots \\ & c_n & v_n \end{bmatrix}$$

In the Type, c_n is the N characteristics of things n ; v_n the value of N about c_n .Matter element has extensibility, provides the possibility for things to expand, parallel, alternative.

(1) The classical field matter elements

$$R_i = \begin{bmatrix} & c_1 & v_{1j} \\ N_j & c_2 & v_{2j} \\ & \vdots & \vdots \\ & c_n & v_{nj} \end{bmatrix} = \begin{bmatrix} & c_1 & <a_{1j}, b_{1j}> \\ N_j & c_2 & <a_{2j}, b_{2j}> \\ & \vdots & \vdots \\ & c_n & <a_{nj}, b_{nj}> \end{bmatrix}$$

In the type, N_j j levels $(j = 1, 2, \cdots, m)$ of things; c_{ij} the j level i Feature of things; v_{ij} the value range of N_j on c_i , namely the classical domain $<a_{ij}, b_{ij}>$.

(2) Node field element

$$R_p = \begin{bmatrix} & c_1 & v_{pj} \\ N_p & c_2 & v_{pj} \\ & \vdots & \vdots \\ & c_n & v_{pj} \end{bmatrix} = \begin{bmatrix} & c_1 & <a_{p1}, b_{p1}> \\ N_p & c_2 & <a_{p2}, b_{p2}> \\ & \vdots & \vdots \\ & c_n & <a_{pn}, b_{pn}> \end{bmatrix}$$

In the type, N_p for things all levels; v_{pi} therange of N_p on the c_i , the joint domain $<a_{pi}, b_{pi}>$.

(3) Be reviewed matter element.

$$R_k = \begin{bmatrix} & c_1 & v_1(t) \\ N_k & c_2 & v_2(t) \\ & \vdots & \vdots \\ & c_n & v_n(t) \end{bmatrix}$$

In the type, N_k for rating objects in matter element system; $v(t)$ is a standard value of t evaluation of index c_n . Theseare initially correlation function. The maximum value achieve at the midpoint of $<a_{ij}, b_{ij}>$ .Establish the correlation functions; make the correlation calculation does not depend on subjective judgment or statistics. [33]

(4) To determine the weight of each index entropy method.
Make the single index correlation $K_j(v_i(t))$ normalized to the k_{ij} , to have i feature entropy:

$$e_i = -\eta \sum_{j=1}^{m} p_{ji} \ln p_{ji}$$

$$\eta = \frac{1}{\ln m}; p_{ji} = \frac{k_{ji}}{\sum_{i=1}^{m} k_{ji}}$$

In the type , η is a constant, p_{ji} for the k_{ij} ratio of the system in m different states, while $p_{ij} = 0, \ln p_{ji} = 0$, entropy has i featured for:

$$\alpha_i = (1 - e_i) / [n - \sum_{i=1}^{n} e_i]$$

(5) Multi index comprehensive correlation function. The correlations function for object n of class j :

$$K_j = \sum_{i=1}^{n} \alpha_i K_j (v_i(t))$$

Determine the competitiveness evaluation cannot do without the index weight. The method to determine the weights whether is objective, directly linked to the quality of the evaluation results. Dependingon the idea of entropy, we can improve the decision accuracy and reliabilityaccording to the quantity and quality of information in decision making. Entropy is calculatedaccording to the various evaluation index value in the given evaluation object set. The metric entropy is bigger, the entropy weight is small, and the index is less important; on the contrary, the index is more important.In information theory, entropy is used to measure the degree of disorder system.

Information entropy are typically expressed in H , for an index x_i , information entropy can be expressed as $H(x_i)$, formulas is $H(x_i) = -\sum_{i=1}^{n} y_{it} \ln y_{it}$

In the formula, $0\ln 0 \equiv 0; i(i = 1, 2, \cdots, n)$, denote the number of evaluation index. y_{it} original data after numericalnormalized. A formula for calculation is[34]:

$$y_{it} = x_{it} / \sum_{t=1}^{T} x_{it}, i = 1, 2, \cdots, n$$

TOPSIS INTEGRATION

The TOPSIS method（Technique for Order Preference by Similarity to an Ideal Solution ）was proposed in 1981 by C.L.Hwang and K.Yoon. This method sorts the evaluation of existing objects, according to the distance between the limited objective and ideal goal. There are two ideal targets (Ideal Solution), one is an ideal target for sure (positive ideal solution), the other is the ideal target of negative (negative ideal solution). The best assessment of the object should be nearest with the optimal target and farthest with the worst objective. Distance can be calculated using Murkowski distance.

Encounter multiobjective optimization problems, there is usually m evaluation target $D_1, D_2, \cdots, D_m$ each target has n evaluation index $X_1, X_2, \cdots, X_m$. Invite experts to score on the evaluation index (including qualitative index and quantitative index), Then the scoring results expressed as a mathematical matrix form, build thefeature matrix:

$$D = \begin{bmatrix} x_{11} & \cdots & x_{1j} & \cdots x_{1jn} \\ \vdots & & \vdots & \\ x_{i1} & \cdots & x_{ij} & \cdots x_{in} \\ \vdots & & \vdots & \\ x_{m1} & \cdots & x_{mj} & \cdots x_{mn} \end{bmatrix} = \begin{bmatrix} D_1(x_1) \\ \vdots \\ D_i(x_j) \\ \vdots \\ D_m(x_n) \end{bmatrix} = [X_1(x_1), \cdots, X_j(x_i), \cdots X_n(x_m)]$$

Calculate standard matrix

Normalizing the feature matrix, get the normalized vector r_{ij} ,and then establish the matrix norms about the normalization vector r_{ij} :

$$r_{ij} = x_{ij} / \sqrt{\sum_{i=1}^{m} x^2{}_{ij}}$$
$$i = 1, 2, \cdots, m, \ j = 1, 2, \cdots, n$$

Structure weight standard matrix

By computing the weight normalized value v_{ij} , establish a standardized weight value v_{ij} normalization weight matrix

$$v_{ij} = w_j r_{ij}$$
$$i = 1, 2, \cdots, m, \ j = 1, 2, \cdots, n$$

Among them, w_j is the weight of the j index.

To determine the ideal and anti-ideal solution

According to the weight normalized value of v_{ij} to determine the ideal solution A^* and anti-ideal solution A^- :

$$A^* = (\max_i v_{ij} \mid j \in J_1), (\min_i v_{ij} \mid j \in J_2), \mid i = 1, 2, \cdots, m = v_1^*, v_2^*, \cdots, v_j^*, \cdots, v_n^*$$
$$A^- = (\min_i v_{ij} \mid j \in J_1), (\max_i v_{ij} \mid j \in J_2), \mid i = 1, 2, \cdots, m = v_1^-, v_2^-, \cdots, v_j^-, \cdots, v_n^-$$

Among them, J_1 is a profit index set, indicated that the optimal value at the i index; J_2 is the loss index set, said the worst value in the i index. Higherprofitability indexes the more favorable to the assessment results; the smaller loss indexes the better for the assessment results, on the contrary, adverse to the assessment results.

Calculate the distance scale, which is calculating the distance for each target to the ideal and anti-ideal solution, distance scale can be calculated according to the n-dimensional Euclidean distance.Object to ideal solution A^* distance is S^*, to an ideal solution S^- distance is A^-:

$$S^* = \sqrt{\sum_{j=1}^{n}(V_{ij} - v_j^*)^2}$$

$$S^- = \sqrt{\sum_{j=1}^{n}(V_{ij} - v_j^-)^2}$$

Among them, $v_j^* and\ v_j^-$ represent the distance of j the target to the optimal target and the worst objectives. V_{ij} is normalized value of j evaluation index weights for i object. S^* close degree for the evaluation and optimization, the smaller S^* value, the closer distance of the ideal goal and evaluation target, the scheme is better.

Calculation the close degree C_i^* to the ideal solution

$$C_i^* = \frac{S_i^-}{(S_i^* + S_i^-)}, i = 1, 2, \cdots, m$$

In the formula, $0 \le C_i^* \le 1$ when $0 = C_i^*$, $A_i = A^-$, represents the goal is the worst goal; when $1 = C_i^*$, $A_i = A^*$, represents the goal is the best goal. In real multi objective decision making, the existence of optimum target andthe worst objective is very small.

According to the C^* value to arrange the sequence of the evaluation target, the arrangement closer to the C^*, the better, the maximum C^* value is the optimal evaluation target. [35-37]

THE STUDY OF SPORTS INDUSTRY COMPETITIVENESS IN SIX PROVINCES IN CENTRAL CHINA BASED ON ENTROPY WEIGHT AND TOPSIS INTEGRATION

Reference to the popular sports industry competitiveness evaluation index in the academic world, this paper build the following sports industry competitiveness evaluation index of six provinces in central China, following the quantifiable and simplify principle to get the evaluation index as table 1:

Table 1. Evaluation index

Index name	Index code	Index name	Index code
Practitioners	X_1	Sports concept	X_4
Capital resources	X_2	Demand degree	X_5
Physical infrastructure	X_3	Related industrial clusters	X_6
		The government behavior	X_7

According to the data of six provinces` yearbooks and experts` opinions, we can get the sports industry competitiveness data following the quantifiable and simplify principle. The datum is showed in table 2:

Table 2. Six provinces` evaluation values

Provinces	Practitioners X_1		Capital resources X_2	
	Evaluation value	Ranking	Evaluation value	Ranking
P_1	1065	1	9248	4
P_2	937	6	8573	6
P_3	945	5	8864	5
P_4	990	4	9976	1
P_5	1010	3	9623	2
P_6	1037	2	9454	3
Provinces	Physical infrastructure X_3		Sports concept X_4	
	Evaluation value	Ranking	Evaluation value	Ranking
P_1	0.99	1	0.85	5
P_2	0.84	6	0.92	3
P_3	0.86	5	0.96	2
P_4	0.91	4	0.89	4
P_5	0.95	3	0.99	1
P_6	0.96	2	0.71	6
Provinces	Demand degree X_5		Related industrial clusters X_6	
	Evaluation value	Ranking	Evaluation value	Ranking
P_1	36	6	260	4
P_2	41	2	267	1
P_3	38	5	250	5
P_4	40	3	253	3
P_5	39	4	249	6
P_6	42	1	261	2
Provinces	The government behavior X_7			
	Evaluation value	Ranking		
P_1	0.71	5		
P_2	0.66	6		
P_3	0.97	1		
P_4	0.84	4		
P_5	0.85	3		
P_6	0.92	2		

Then use these seven indicators, to evaluate and we can get:

Relevant experts` subjective weight to the seven indexes

$$w` = [0.076, 0.230, 0.242, 0.050, 0.162, 0.170, 0.070]$$

According to the entropy formula to determine the entropy w of the seven indicators, and determine the weight λ of each index attable 3:

Table 3. The weight λ

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
w	0.083	0.194	0.234	0.044	0.188	0.183	0.074
$w`$	0.076	0.230	0.242	0.050	0.162	0.170	0.070
λ	0.062	0.237	0.303	0.011	0.157	0.170	0.060

According to the formula to standardize the index judging matrix $Y=(y_{ij})$,Based on matrix Y , according to the formula to construct weighted decisionmatrix Z

According to the formula to determine ideal and the negative ideal solution of the evaluation object, respectively:

$$Z=\begin{pmatrix} 0.0550 & 0.1058 & 0.1453 & 0.0636 & 0.0680 & 0.0058 & 0.0374 \\ 0.0523 & 0.1034 & 0.1257 & 0.0840 & 0.0702 & 0.0064 & 0.0365 \\ 0.0535 & 0.1047 & 0.1286 & 0.0672 & 0.0708 & 0.0047 & 0.0320 \\ 0.0547 & 0.1081 & 0.1375 & 0.0733 & 0.0693 & 0.0050 & 0.0301 \\ 0.0552 & 0.1069 & 0.1405 & 0.0872 & 0.0724 & 0.0013 & 0.0289 \\ 0.0517 & 0.1032 & 0.1107 & 0.0621 & 0.0483 & 0.0011 & 0.0246 \end{pmatrix}$$

$$S^{+}=(0.0552, 0.1081, 0.1453, 0.0872, 0.0724, 0.0064, 0.0374)$$

$$S^{-}=(0.0517, 0.1032, 0.1107, 0.0621, 0.0483, 0.0011, 0.0246)$$

According to the formula to determine thedistance of each province to the ideal solution and negative ideal solution, and calculate the relative degree of the provinces and the ideal solution.Results are showed in table 4:

Table 4. Relative degree of the provinces and the ideal solution

	P_1	P_2	P_3	P_4	P_5	P_6
Sd^{+}_{i}	0.0059	0.0282	0.0171	0.0131	0.0245	0.0126
Sd^{-}_{i}	0.0308	0.0072	0.0211	0.0189	0.0158	0.0163
ζ_i	0.8371	0.2028	0.5516	0.5913	0.3905	0.4302

According to the judgment criterion, from the table we can see $P_1 > P_4 > P_3 > P_6 > P_5 > P_2$.

CONCLUSION

This paper use entropy weight and TOPSIS integration method to data mining the Middle six provinces` sports industry. Get the six provinces of central China sports industry competitiveness ranking, and determining the weight of each index, to provide help for the future development of the sports industry.

However, this study also has shortcomings: (1) there are subjective factors in the process of research; (2) in the process of the selection of evaluation indexes, some evaluation indexes are ignored for the simplify the operation principle; (3) the relative lack of research of value six central provinces overall. These problems will be improved in the upcoming study.

REFERENCES

[1] Lei Xunping. Research on the science and technology competitiveness evaluation based on entropy weight and extension decision model for the case of six provinces in Central China[J] *Science & technology progress and policy*, **2013** (2).
[2] Zhang Zhongjiang. Some views of our sports industry structure adjustment in the new century[J] *Journal of physical education*, **2000**, (6)
[3] BaoXiaoming. Sports industry -- a new economic growth point[M] Beijing: People's sports press, **2000**
[4] Duan Hongyan, XuFa. Analysis of the factors affecting the international competitiveness of China'ssports industry[J] Journal of sports adult education, **2007** (10)
[5] Wu Shaozu, Chen Junming, Su Zhencai. Sports history of the People's Republic of China[M]Beijing: China books publishing house, **1999**
[6] Zhang Chaohui. Effects of globalization of sports industry and its development of Chinese sports industry[J] Journal of Chengdu Sport University, **2000**, (3)
[7] Yin Li. The Olympic and sports industry[N] market report, **2009**-9 -27 (4)
[8] Vemon Raymond. International Investment and Internationa1 Trade in the Product Cycle [J] *Quarterly Journal ofEconomics*. **1966**. 80
[9] GortMichaeI, Klepper Steven. Time paths in the diffusion ofproduct innovation [J] *The Economic Journal*, **1982**,92

[10] Michael, Potter. The national competitive advantage [M] Beijing: Huaxia publishing house, **2007**
[11] Dunning John H. *Management International Review Second Quarter*, **1993**, 33(2):7 -15
[12] Dong-sung Cho, Hwy-chang Moon, Min-young Kim. Characterizing international competitiveness in international business research: A MASI approach to national competitiveness [J] *Research in international Business and Finance*, **2008**, 22
[13] Zhang Jinqiao. *Journal of Wuhan Sports Institute*, **2005**, 39 (8): 28 - 31
[14] Chang Baorong. Effect of factor endowment status of western region and the sports industry[J]Journal of physical education, **2005**, (6): 7 -10
[15] Zhang Jinqiao. *Study on productivity*, **2006**, (10): 206-209
[16] Jiang Gangqiang, Tong Jian Hong. *Journal of Shanghai Institute of Physical Education*, **2009**, 33 (6): 33 - 37
[17] Xu Yanfang. Study on regional comparative advantage of culture industry development[D]Doctoral thesis of Shandong University, **2009**
[18] Wang Shijun. Study on the integrated comparative advantage theory [D]Doctoral thesis of Zhejiang University, **2006**
[19] Fan Yunfang. Agglomeration, the international division of labor and Chinese comparative advantage study [D]Doctoral thesis of Northwestern University, **2009**
[20] Xia Chongde,Chen A, Yin Ying. *Journal of Beijing Sport University*, **2007**, 30 (11): 1564 - 1566.1570
[21] Chen Po. *Journal of Capital Institute of Physical Education*, **2007** (2): 69 -74
[22] Chen Jianshe. *Journal of Guangzhou Sports University*, **2007** (11): 67 -70
[23] Zhao Hengmin, Zhang Tieling. Study on the construction of sports social assessment system[J] *Journal of Beijing Sport University*, **2007** (10)
[24J Luo Zhi.Study on regional division of each grade project groups in China under the theory of comparative advantage[D]Doctoral thesis of Beijing Sport University, **2004**.6
[25] Luo Zhi. Study on regional division of each grade project groups in China under the theory of comparative advantage[M]Beijing Sport University press, **2006**.8
[26] Luo Zhi. *Journal of Tianjin University of Sport*, **2008** (1): 21 -25
[27] LuoZhibo. *Journal of Beijing Sport University*, **2013** (2)
[28] Song Zhijie. Analysis and evaluation of Hebei Province Sports Industry Competitiveness[J] *Journal of Yanshan University*, **2006** (5)
[29] Gao Maozhang. Study on the competitiveness of Henan sports industry based on Diamond Model[J] *Journal of Henan University of Science and Technology* (SOCIAL SCIENCE EDITION), **2011** (6)
[30] Chen Lixin. Analysis of current situation of sports development in China and Countermeasures[J]*Study of sports science* **2003** (6)
[31] XieHongwei. Research on evaluation index system of regional sports industry comparative advantage[J] *Journal of Beijing Sport University*, **2012** (6)
[32] Jin Yinghua. Analysis of factors influencing the competitiveness of Chinese golf industry[J] *Journal of Beijing Sport University*, **2013** (2)
[33] Mei Yitao. The dam seepage behavior entropy fuzzy extension evaluation model based on[J] *Water power source science* **2011** (8)
[34] Li Hao, LuoGuofu, XieQingsheng. Evaluation model of dynamic allied manufacturing resources based on application service provider[J] *Computer integrated manufacturing system* (5) **2007**
[35] Sun Fusheng. Evaluation of Heze city in 2011, the quality of TB prevention and control workin 2011 of TOPSIS tuberculosis prevention and control work quality in Heze cityby TOPSIS evaluation method[J] *Chinese medical science*, **2013** first (2)
[36] He Zhijun. Optimization of coal blending pulverized coal injection into blast furnace based on TOPSIS decision[J] *Energy for metallurgical industry, first* (4) **2013**
[37] ZhengLimin. DTOPSIS comprehensive evaluation method in the Yangtze River Basin in spring soybean[J] *Southern agriculture*, **2013** first (4)