An Empirical Study on Regional Scientific Research Evaluation through Application of H-Index: A Case Study of 11 Regions of Zhejiang Province in China

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Abstract - This paper collected h-index samples of 11 regions of Zhejiang province in China from 2000 to 2013 based on China academic journal network publishing database and ISI web of science. Then the correlation analysis was conducted among the number of papers, the total number of citation, the average number of citation and h index. This paper think h index can provide reference standards of regional scientific research evaluation and reflect the condition of regional scientific research. This paper also recognize simultaneously that this study has some shortcomings need to improve in the future**.**

Index Terms – h index, scientific research evaluation, informetric analysis, regional evaluation.

1. Introduction

The scientific research papers are often used as one of the vital aspects to evaluate institutions and individual impact of scientific research and level of scientific research. The traditional evaluation indicators of scientific research papers including the total citation frequency, total cites, a number of papers funded, etc., have played a very important role in the academic evaluation. However, the traditional evaluation indices have some shortages respectively.

A. The profile of h-index

In 2005, a popular citation index, the h-index, was developed by Hirsch, who is a physicist in University of California San Diego, for measuring the academic impact of scientists[1]. h-index, which took into account the academic output and impact simultaneously, make up for the defects of the traditional indicators. The application of this index has been extended to journals[2], academic teams[3], institutions[4]and science funds[5].

B. The extended application of h-index

The application of the h-index can also be extended to the evaluation of the level of regional research. For example, Edit Csajbók present ranked lists of world's countries – with main focus on EU countries – by their h-index on various science fields based on Thomson Scientific's Essential Science Indicators (ESI) database[6]. In addition, 236 countries and regions were ranked by SCImago Journal & Country Rank website through h-index based on Scopus database [7].

The output of scientific research papers and its impact can reflect the level of scientific research in a certain angle. H-index taking into account the quantity and quality of output of scientific research is expected as a new indicator of the regional level of scientific research in the analysis.

C. Defining h-index of the regions

In this paper, h-index of the regions is defined as follows:

A region has index h if h of its N_p papers have at least h citations each and the other (N_p–h) papers have ⩽h citations each.

H-index can be used as a useful index to characterize the scientific output of a region.

D. The Purpose of this paper

This paper would attempts to 11 prefecture-level city in Zhejiang Province in China as objects of research, exploring the feasibility of the h-index used in the evaluation of regional scientific research.

2. Methodology and Empirical Study

A. The source of journals databases

Generally speaking, the scientific research papers are divided into two parts in mainland China: one part was published in the domestic journals; Another part was published in foreign journals, which can reflected the international impact. To obtain the h-index needs to have the database of the citation functions as a data source, the database of choice in this article are as follows:

1) The data source of articles and citations of Chinese Journals was China Academic Journals Full-text Database with citation functions, which include more than 7900 academic journals officially published.[8]

2*)* The data source of articles and citations of foreign Journals was Web of science（SCIE/SCI/A&HCI）. Web of Science is a large comprehensive, multidisciplinary, core journals Citation Index database, and it includes more than 13,000 species worldwide, which are most influential, high-quality, peer-reviewed journals.[9]

B. Data Acquisition

We can gain the number of published papers and h index of 11 regions of Zhejiang province in China through retrieving China Academic Journals Full-text Database and Web of science.

1) Time coverage of data acquisition: 2000-2013.

2) Retrieval time: February 6, 2014 –February 10.

3) The search fields included address and affiliation. For example, retrieving the papers of Wenzhou region indexed by web of science (SCIE/SCI/A&HCI) from 2000 to 2013, the search strategy in this study is as follows:

Address =(Wenzhou) AND Address =(Peoples R China)

Time coverage = 2000-2013. Database=SCI-EXPANDED, SSCI, A&HCI.

The results of data acquisition shown in Table Ⅰ.

The distribution of h-index shown in Figure Ⅰ.

Table Ⅰ H-index of scientific research papers of 11 regions in Zhejiang Province

Serial number	Region	p-cnki	h-cnki	p-wos	tc-wos	ac-wos	h-wos
1	Hangzhou	252895	189	72193	550975	7.63	143
2	Ningbo	100497	91	7074	36823	5.21	57
3	Jinhua	33348	77	4085	23124	5.66	47
4	Wenzhou	72416	78	6043	33750	5.58	54
5	Shaoxing	37257	63	1207	5597	4.64	28
6	Huzhou	25506	55	1147	6312	5.50	33
7	Taizhou	34449	54	1435	6353	4.42	31
8	Jiaxing	26410	56	1238	5576	4.50	28
9	Lishui	22697	45	666	4273	6.42	32
10	Zhoushan	13415	45	607	2684	4.43	21
11	Quzhou	13733	35	149	611	4.30	13

Note:
p-cnki: the number of papers from China Academic Journals Full-text Database
p-wos: the number of papers from Web of science
h-cnki: h-index from China Academic Journals Full-text Database
h-wos: h-index from Web of science
tc-wos: The total number of citation from Web of science
ac-wos: The average number of citation from Web of science

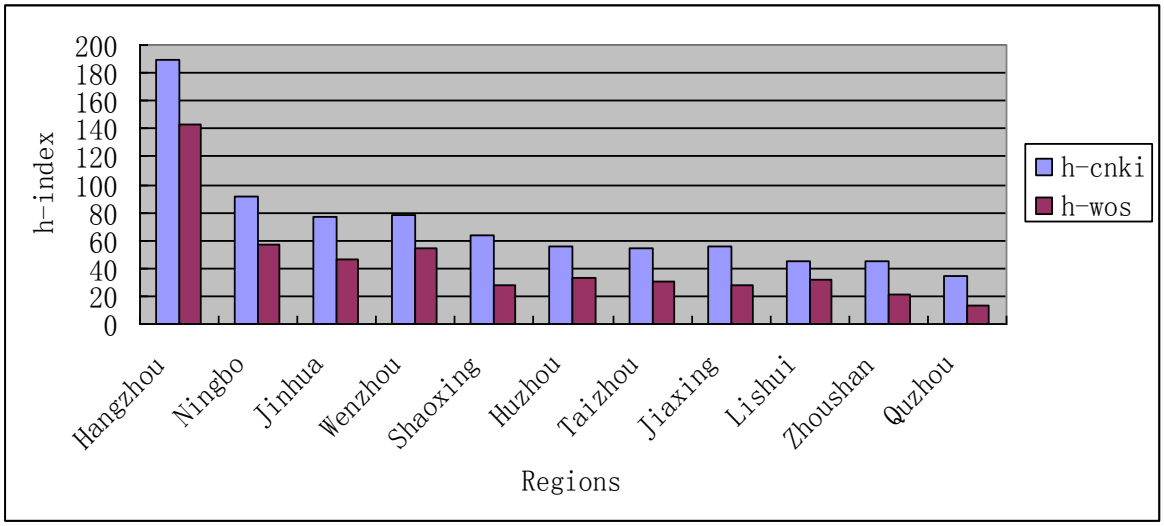

Figure Ⅰ The distribution of h-index of 11 regions of Zhejiang province in China

C. Data Analysis and Results

In this paper, analysis of the correlation was performed for the data in Table through the application of SPSS.

The results of analysis of the correlation shown in Table Ⅱ and Table Ⅲ.

Table Ⅱ analysis of the correlation to p-cnki and h-cnki

		p-cnki	h-cnki
p-cnki	Pearson Correlation		0.982**
	Sig. (2-tailed)		0
	N		11
h-cnki	Pearson Correlation	0.982**	
	Sig. (2-tailed)	0	
	N	11	

**.Correlation is significant at the 0.01 level (2-tailed).

Table Ⅲ analysis of the correlation to p-wos, tc-wos, ac-wos and h-wos

		p- wos	tc- wos	ac- wos	h- wos
p- wos	Pearson Correlation		.999(**)	.773(*)	.959(**)
	Sig. (2-tailed)		.000	.005	.000
	N		11	11	11
tc- wos	Pearson Correlation	.999(**)		.770(*)	.951(**)
	Sig. (2-tailed)	.000		.006	.000
	N	11		11	11
ac- wos	Pearson Correlation	.773(*)	.770(*)		.836(**)
	Sig. (2-tailed)	.005	.006		.001
	N	11	11		11
h- wos	Pearson Correlation	.959(**)	.951(**)	.836(**)	
	Sig. (2-tailed)	.000	.000	.001	
	N	11	11	11	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

3. Discussion

In the Table Ⅱ, the correlation coefficient of p-cnki and h-cnki is 0.982. We have observed a highly significant positive correlation between p-cnki and h-cnki. The result showed that the rank of the h-index can reflect the level of regional scientific research by analysis of Chinese scientific research articles.

In the Table Ⅲ, the correlation coefficient of h- wos and p- wos, tc- wos, ac- wos were 0.959, 0.951, 0.836 respectively. We have observed a highly significant positive correlation among h- wos and p- wos, tc- wos and ac- wos. The results showed that the rank of the h-index can also reflect the level of regional scientific research by analysis of foreign scientific research articles.

However, this study have some defects. Firstly, the size of sample was too small in this paper, so the representativeness of the study and the application of statistical methods need consider carefully. Secondly, this study had taken into account of the signature sequence of institution, so there were free-riding phenomenon in some samples.

4. Conclusions

In summary, h-index, which took into account the academic output and impact simultaneously, make up for the inadequacies of the traditional indicators. h-index can be used as indicator of the measuring the level of regional scientific research.

However, the scientific research papers can only reflect one aspect of the achievement of scientific research because of the achievement of scientific research have a lot of literature forms, such as scientific research reports, monographs, patents, etc.; h index is relatively applicable to the outcome evaluation of science (including mathematics, physics, chemistry, life sciences, etc.), but it is not suitable for the results of the evaluation of engineering science. h-index used in the evaluation of regional scientific research, only as a factor in the evaluation system, does not fully reflect the overall situation of regional scientific research.

To some extent, the h-index, which reflects the region's research status, can be used as a reference indicator of evaluation of the regional scientific research by analyzing above.

In order to measure the h-index of the achievement of regional scientific research better, we also need more in-depth study of the mechanism of the h index for the amendment of the relevant algorithms in the future.

Acknowledgment

This research is supported by the science and technology

projects Funds from Wenzhou Science and Technology Bureau [Grant ID: R20100046] and the philosophy and social science planning projects Funds from Wenzhou Federation of Social Science Circles [Grant ID: 13wsk056].

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