World Journal Clout Index (WJCI)

Index Description

1 Selection of statistical source journals

1.1 Proportion of statistical source journals from different count ries/regions

The project team investigated comprehensive databases including Ulrich's Periodicals Directory, SCI database and SCOPUS database, six professional databases including EI (for engineering technology), MEDLINE and PMC (for biology and medicine), Chemical Abstracts (CA, for chemistry), MathSciNet (Mathematical Reviews, MR, for mathematics), GeoRef (for geoscience), and CABA (for agriculture), as well as international databases such as RSCI (Russia), JSTAGE (Japan), KCI (Republic of Korea). The inclusion standard, discipline classification system, and journal directories of each database were summarized and analyzed, based on which a total of 63,000 or more active STM journals worldwide were sorted out. A quarter of the journals (about 15,000 journals) were selected as the source journals for statistics, and the finalists were confirmed through primary quantitative selection and expert review.

In order to comprehensively evaluate the development status of science and technology and STM journals in each country/region on scientific basis, the number of statistical source journals from different countries/regions is determined from four dimensions: (1) R&D input; (2) output of scientific papers; (3) number of scientific researchers; and (4) the scale and level of journals.

1.2 Selection method and results

After determining the number of source journals from different countries/regions, we need to select high-quality journals of "region- and discipline-representative" from all STM journals in each country/region. The selection method is illustrated as follows:

(1) Preliminary selection using the citation-based WAJCI index

The statistical source journals are preliminarily selected using quantitative evaluation indexes based on citation. We counted the cites of all journals cited by Crossref in 2019, calculated the number of papers in the journal, IF and total cites (TC), and then calculated the World Academic Journal Clout Index (WAJCI) by

discipline. On this basis, the statistical source journals in each country/region were determined according to the target number of journals.

(2) Ensuring high-quality journals are included in source journals

The three journal lists of the WAJCI Annual Report 2019 (Q1&Q2), JCR-SCIE 2020 (Q1&Q2), and Scopus 2020 (Q1&Q2) were compared with the journals selected in the previous step. Results found a total of 1,674 journals were not included. Then, this list entered the source journals to replace those ranked at the bottom in the first step.

(3) Special adjustments

After analyzing the source journals selected in the above two steps, it is found that the journals selected from some countries are not ideal. Therefore, we made the following adjustments. By reference to the evaluation results of the three core journal lists in China (CSCD, ISTIC, Core Journal of Peking University), 1,605 Chinese journals were selected, of which 133 were excluded due to low IF (not included in Q1 of the Annual Report for Chinese Academic Journals Impact Factors). For Russian journals, 489 were selected on the ground of Clout Index (CI) values calculated by the evaluation indexes released by RSCI. The number of journals in the UK was adjusted to be 2,853 as there are many journals included in various databases and a large number of journals with high evaluation indexes.

On a selective basis, the quota assigned to Japan, France, Italy, Spain and other non-native English speaking countries is not fulfilled, which will be further supplemented and improved in future cooperation with local publishing institutions or academic groups in each country.

(4) Excluding journals with large quantity and low quality

Totally 51 journals included in Q3 and Q4 of WAJCI and with Journal Mass Index (JMI) at the bottom of the ranking were excluded. The JMI is calculated by IF divided by the number of articles published in the journal, which can effectively reveal those journals with large article quantity and low quality.

(5) Excluding journals with low quantity

Totally 273 journals were excluded, whose average number of citable documents in 2017–2019 is equal to or less than 5.

(6) Adjustments according to the expert advice

After expert review and recommendation, 298 poor-quality journals were excluded, and 68 journals were added.

Finally, 14,287 source journals were included.

2 Evaluation index—World Journal Clout Index (WJCI)

In order to achieve the aim of reflecting the journal impact more comprehensively and objectively, the project team developed a new evaluation index——World Journal Clout Index (WJCI), considering the World Academic Journal Clout Index (WAJCI, weight of 0.8) based on citation data and Web Impact (WI, weight of 0.2) based on web usage data.

The World Academic Journal Clout Index (WAJCI) was first proposed by CNKI in its Annual Report on the Impact Factor Index of World Academic Journals (2018), and it is a comprehensive index for evaluating the citation impact of journals with the CI standardization in disciplines.

The Web Impact (WI), first proposed in this study, is a new evaluation index based on the usage data of international web users and the download data from journal full-text databases in China.

2.1 Academic impact indexes based on citation data (CI, WAJCI)

(1) Clout Index (CI)

It is generally believed that the most influential journals in a field should be those with the highest TC and IF in the subject, such as *The New England Journal of Medicine*. CI is a value calculated by vector equal weight after linearly normalizing the IF and TC of journals in a group in a statistical year. It represents the similarity between a certain journal and the journal with the highest impact in the field. The greater the CI value, the closer the impact of the journal is to the best one. CI is a comprehensive index that takes into account TC (representing the effective impact of a journal's article quantity and history) and IF (a representative index of the average article quality). To a certain extent, it can correct the one-sided evaluation of journals brought about by single use of IF or TC.

Definition 1: Journal impact ranking space

The IF and TC of journals in the same discipline are mapped to a two-dimensional space, which is called "journal impact ranking space." The two values are divided by the maximum of the discipline and normalized to obtain A and B. The "journal impact ranking space" is a plane orthogonal coordinate system, where the abscissa is the normalized IF, and the ordinate is the normalized TC. According to (A, B), each journal corresponds to a point in this space (Figure 1).
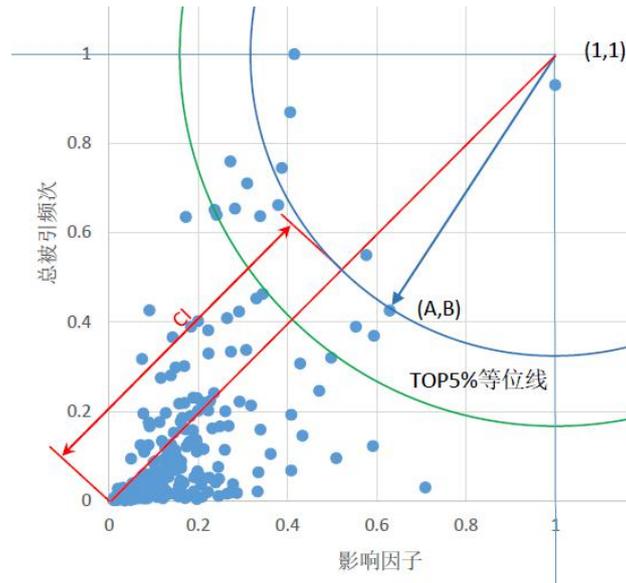
Figure 1 Schematic diagram of clout index (CI) and equipotential line

影响因子：Impact factor   总被引频次：Total cites   TOP5%等位线：TOP5% equipotential line

Definition 2: Equiimpact line of journals

In the "Journal impact ranking space," the journal with the highest impact is defined as (1, 1). The line formed by the points with equal distance with point (1, 1) is the equiimpact line of journals. Obviously, the equiimpact line is an arc centered on (1, 1).

Definition 3: Clout Index (CI)

The Clout Index (CI) is the distance from the intersection of the equiimpact line where the journal is located and the connection between (0, 0) and (1, 1) to the origin (0, 0). The calculation formula is as follows:

$$CI = \sqrt{2} - \sqrt{(1-A)^2 + (1-B)^2}$$

$$\text{where} \quad A = \frac{IF_{journal} - IF_{min}}{IF_{max} - IF_{min}} \qquad A \in [0,1]$$

$$B = \frac{TC_{journal} - TC_{min}}{TC_{max} - TC_{min}} \qquad B \in [0,1]$$

(2) World Academic Journal Clout Index (WAJCI)

The World Academic Journal Clout Index (WAJCI) is the ratio of a journal's CI to the median CI of the worldwide journals in this discipline. This value reflects the multiple of the CI of a journal relative to the CI of the journal ranked in the middle in this discipline, and can be used for discipline ranking and cross-year comparison of

the journal.

WAJCI = Journal CI/Median CI of journals in the discipline

When WAJCI = 1, the CI of a journal is equal to the median of journals in the discipline. A larger WAJCI value indicates a higher level of the journal. The WAJCI reflects the relative position of academic impact of a journal in the discipline, which can be applied to cross-disciplinary and cross-year comparison.

2.2 A bibliometrical index based on web usage: WI

Network communication and mobile internet have brought about new formats of scientific research and publishing, such as open science and open access. Citations do not reflect the impact of academic research results in a timely and complete manner due to certain lag and limitations that they must be cited by users in published articles. Therefore, it is necessary to find new indicators to supplement it. This study is a preliminary attempt to introduce the statistical results of users' mention and usage data of the latest published articles of journals on the Internet to reflect the comprehensive impact of the latest academic results of journals in the academic community and society.

For the usage data of international network users, the index of "total mentions" for 2019 journal articles in Altmetric provided by Digital Science & Research Solutions is introduced through international collaboration.

Due to the particularity of Chinese language and network environment, the usage of Chinese journals can hardly be illustrated in Altmetric. Under this context, we introduce CNKI downloads and Wanfang database downloads as alternative measures to show the function of Chinese journals for Chinese scholars (accounting for 27% of the global total). In this study, the sum of downloads of journal articles published in 2019 by CNKI users and Wanfang users in 2019 is used as the original index.

Statistics show that the web usage data vary greatly among journals, with a large number of mentions and downloads in several leading journals, while extremely low in most journals. Taking "total mentions" as an example, the maximum is 13,506 times the median value and 1,225 times the average value. For most journals, this index is approximately equal to 0 if the conventional normalization method is used. For this reason, we adopt a segment assignment method for both data and set the weight of "total mentions" and Chinese domestic downloads to be 0.8 and 0.2, respectively, in the calculation of WI.

Taking "total mentions" as an example, the specific segment assignment method is as follows: The source journals with "total mentions" are sorted by size and divided into ten equal segments after removing the low-scoring journals at the bottom 20%. The WI of journals in each segment is obtained by backward induction from the

weight corresponding to the average WAJCI value of journals in each segment. All journals in the same segment have the same WI score.

2.3 World Journal Clout Index (WJCI)

$$WJCI_i = WAJCI_i + WI_i$$