

# **World Journal Clout Index (WJCI)**

## **Index Description**

### **1 Selection of statistical source journals**

#### **1.1 Proportion of statistical source journals from different countries/regions**

The project team investigated comprehensive databases including Ulrich's Periodicals Directory, SCI database and SCOPUS database, 6 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), and 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 61,000+ continually publishing STM journals worldwide were sorted out. In 2021, a quarter of the journals (about 15,000 journals) were selected as the source journals for statistics, and the final list was 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 4 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 were preliminarily selected using quantitative evaluation indexes based on citation. We counted the cites of all journals in the statistical year, IF and total cites (TC), and World Academic Journal Clout Index (WAJCI) in "World Citation Database" built by the project team. And then, the

statistical source journals were determined according to the value of WAJCI.

## **(2) High-quality journals of other evaluation institutions as references**

Internationally, JCR-SCIE 2020 Q1/Q2 journals and Scopus 2020 Q1/Q2 journals were referenced. Domestically, the selected journals in "China STEM Journal Excellence Action Plan", the T1-level journals of the high-quality sci-tech journals directory by CAST in 20 fields and the latest source/core journals of major evaluation institutions were introduced.

## **(3) Special adjustments**

The UK has a large number of journals with a long history and good quality. Therefore, we re-determined the number of source journals in this country. As the evaluation of the "World Citation Database" for non-native English language journals cannot fully reflect their research level in 6 countries of Germany, Italy, Japan, France, Russia, and Republic of Korea, journals in these countries were dealt with separately.

## **(4) Excluding journals with low WJCI index**

Journals whose WJCI index falls in Q4 among the newly selected journals in 2021 were excluded.

## **(5) Expert review**

Based on the journal list 2020, the project team selected the statistical source journals in 2021 according to the above method, and checked the publication status of the included journals. After exclusion of the journals that had been suspended, journals with low article quantity, in social science, non-academic, and unsuitable for evaluation (data papers, comprehensive conference proceedings, and unstable publication series) and journals deemed by peer reviewers to be of low quality, **14,665 source journals were finally determined.**

## **2 Evaluation index—World Journal Clout Index (WJCI)**

In order to reflect the journal impact more comprehensively and objectively, the project team developed a new evaluation index—World Journal Clout Index (WJCI), which integrates the World Academic Journal Clout Index (WAJCI) based on citation data and Web Impact (WI) 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)

Statistics show that the most influential journals in a field should be those with both the highest total citations (TC) and impact factor (IF) in the subject, such as the position of *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 position. CI is a comprehensive index that takes into account TC (representing the effective impact of a journal's article quantity and history) that reflects its importance in the discipline and IF (a representative index of the average article quality) reflecting its advancement in the discipline. To a certain extent, the combined use of TC and IF 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 2 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), and the best position is (1, 1).

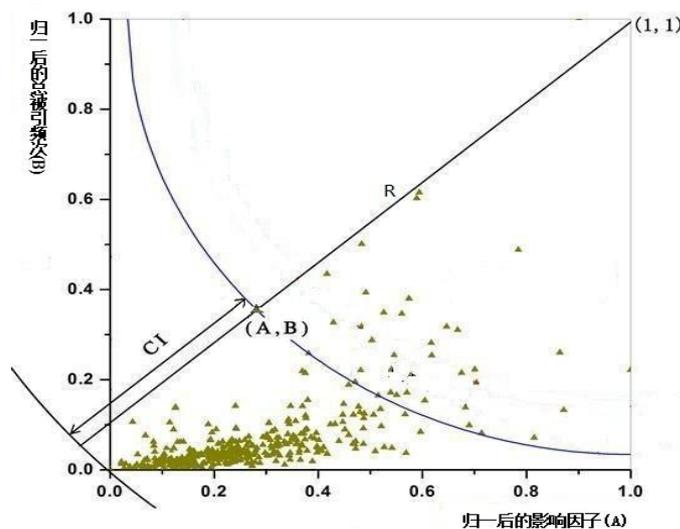


Figure 1 Schematic diagram of clout index (CI) and equipotential line

### **Definition 2: Equiimpact line of journals**

In the “Journal impact ranking space,” the journal with the highest clout 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:

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

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

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

### **(2) World Academic Journal Clout Index (WAJCI)**

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.

$$\text{WAJCI} = \text{Journal CI} / \text{Median CI of journals in the discipline}$$

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.

For special adjustments, the research group searched out 26 journals in the top 1% of global publication volume and the bottom 2% of global Journal Mass Index (JMI), which basically covered the list of “megajournals” provided by experts. The weight of the cites in CI of these journals was lowered (multiplied by 0.05).

## **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 2020 journal articles in **Altmetric** provided by **Digital Science & Research Solutions** is introduced through collaboration.

Due to the particularity of Chinese language and network environment, the usage of Chinese journals can hardly be illustrated now in Altmetric. Under this context, we introduced the pageviews and downloads from CNKI, Wanfang, and Chinese Medical Journal Net as alternatives to show the function of Chinese journals for Chinese scholars (accounting for 27% of the global scholars). To reflect the web impact of Chinese and international journals in China, the project team calculated pageviews of Chinese and international journals in CNKI database. In this study, the sum of pageviews and downloads of journal articles published in 2020 by CNKI users, Wanfang users and Chinese Medical Journal Net in 2020 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 11,690 times the median value and 839 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" in and China to be 0.7 and 0.3, respectively, in the calculation of WI.

Taking "total mentions" as an example, the specific segment assignment method is as follows: The source journals in a discipline are ranked by "total mentions" and divided into ten equal segments. 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 and extensively consulted with experts. All journals in the same segment have the same WI score.

### **2.3 World Journal Clout Index (WJCI)**

$$\mathbf{WJCI}_i = \mathbf{WAJCI}_i + \mathbf{WI}_i$$