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Contemporary Issue

Bibliometric Indices of Scientific Journals: Time to overcome the obsession and think beyond the Impact Factor

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ABSTRACT

Journal Impact Factor (JIF) has been widely used for a long time as a proxy marker of journal prestige. However, off late, accuracy and reliability of JIF for evaluation of scientific journals has been increasingly questioned by numerous stakeholders in the field of scholarly publications. Having realized the perils and pitfalls of JIF, there is an increasing understanding among academia to develop and consider alternatives to the traditional JIF. It is possibly time for all concerned to understand the pros and cons of JIF to overcome this obsession. Limitations of JIF and possible alternative and emerging bibliometric indicators are being discussed in this article for the benefit of the readers of MJAFI.

Introduction

Evaluating quality of scientific journals has always been an onerous task. Ever since Eugene Garfield's introduction of a simple citation metric, the 'Journal Impact Factor' (JIF), it has been widely used by librarians, readers, authors, publishers and other stake holders as a surrogate marker for ranking scholarly journals and as a measure of journal prestige metrics.[1] Simply stated, JIF is calculated by the total number of citations received by papers published in a particular journal divided by the total number of publications in that journal over a specific time period. JIF is considered as an indicator of the average number of citations received per published article. Presently JIF is being calculated by Thomson Reuters and is published in the Journal Citation Reports (JCR) every year. Since its inception over almost five decades now, JIF continued to be the single most popular and undisputed criterion for evaluating a journal's performance.

However, the accuracy and reliability of JIF for evaluation of scientific journals has been increasingly questioned in the recent past by numerous readers, authors and editors.[2–5] In the current era of 'Publish or Perish' philosophy, there is intense pressure on researchers to publish in high impact factor journals. This has lead to mushrooming of open access paid journals often with misleading and manipulated metrics including JIF to attract unsuspecting authors who are in a desperate need for publications.[6] Having now realized the perils and pitfalls of JIF, there is an increasing understanding among academia of the need to develop and consider alternatives to the traditional JIF.[5,7] Therefore it is time now, for the scientific community to overcome an age-old obsession

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with the JIF, to fully understand the pros and cons of JIF and to be aware about various alternative and emerging bibliometric indicators.

Limitations of Journal Impact Factor

In 1997, Seglen published a landmark article describing in detail the limitations and drawbacks of JIF in the evaluation of published research.[2] Critical evaluation of the JIF revealed the following important facts: (a) The JIF does not truly represent individual journal articles and therefore does not correlate with citations of individual articles. The distribution of various published articles in a journal towards its impact factor is highly skewed. According to Seglen[2] 15% of the most cited articles account for 50% of the total citations, a significant finding which is relevant even today. (b) Calculations of the JIF are inherently flawed and are vulnerable to manipulations. While citations from all types of documents are counted in the numerator, the denominator excludes non citable items (as per Science Citation Index database) like editorials, letters etc. which may have attracted citations. Also, the JIF calculation does not make any correction for self citation. Of late, coercive journal self citation in many forms is another cause for concern.[2,4] JIF does not have the ability to distinguish between various shapes of citation distribution curves.[8] Overall, there is a tendency for inflated citations and thus distorted JIF. (c) Citations and therefore the JIF are related to the type of article published and the subject category. It is a well known fact that review articles, randomized controlled trials, systematic reviews tend to attract more citations than other categories of articles. Similarly, a publication in a field of dynamic research and high activity, e.g. molecular biology and cancer research is expected to attract more citations as compared to other areas. A journal, publishing only select categories of articles in select fields as mentioned above is likely to have relatively higher JIF. Obsession among editors for generating high citations for their journals may have led to distorted scientific editorial and literary practices and proliferation of low to mediocre research outputs which is detrimental in the long run.[2,7] (d) Limitations of database coverage: The Science Citation Index Database is limited in terms of its extent of coverage among varying fields, geographic boundaries and bias for English language.[2] (e) Emerging threats: A potential danger looming at large for the scientific community is the rapid proliferation of questionable/fake journals, publishers, impact factor companies and indexing agencies operating with the sole motto of revenue generation from unsuspecting authors and those desperate for scientific publications for career progression.[6,9]

Alternatives to Journal Impact Factor

Numerous authors, editors and publishers have joined the debate about JIF and have expressed their concern about use and misuse of JIF from time to time for nearly two decades. It is now well known that JIF has many caveats associated with its usage as a marker for journal performance. There has been a constant endeavour among all concerned to look for a suitable alternative to the traditional JIF which could accurately reflect a journal's performance. At this time, it is difficult to pinpoint which bibliometric indicator serves the best as a tool for evaluating a journal's performance. However, it would be worthwhile for the readers of this journal to be aware about alternative journal performance indices, so as to eschew the obsession with JIF especially in the era of ever increasing and rapidly proliferating misleading journal metrics.[10,11]

(a) **Eigenfactor Score:** Originally derived by Bergstrom et al. from the University of Washington, Seattle by using the same datasets as that of JIF. Calculation of Eigenfactor Score (ES) is somewhat similar to JIF; however, it takes into account five years of publication instead of two years. One important feature of ES is that self citations are excluded from the calculation. Another characteristic of the ES is that an incoming citation to a particular journal is weighed by the ES of the citing journal. ES is considered to be a measure of a journal's actual importance to the scientific community. 'Article influence' is a derivative of Eigenfactor, conceptually similar to JIF and SCImago Journal Rank Indicator (SJR). Article influence is a measure of average influence, per article, published in a journal.[12,13]

(b) **SCImago Journal Rank (SJR):** Proposed by the SCImago research group this is a journal bibliometric indicator that uses datasets from the Scopus (a bibliographic database-containing abstracts and citations for academic journal articles). SJR is calculated in a manner similar to ES and article influence score, e.g. incoming citations are weighed based on the SJR of the citing journal. However, as compared to JIF and ES, SJR takes into account of Scopus datasets for a three year period.

(c) **Source Normalized Impact per Paper (SNIP):** Originally created by Moed at the University of Leiden, this is currently considered as one of the most sophisticated journal performance indicators. SNIP measures contextual citation impact by 'normalizing' citation values and corrects for field specific differences in citation rates over a period of three years. Unlike JIF, SNIP numbers of any two journals can be compared regardless of the field.

(d) **CiteScore:** Developed by Scopus, CiteScore is a simple way of measuring journal citation impact. CiteScore is a measure of the average number of citations received by a journal in a particular calendar year out of the total number of documents published and indexed in Scopus for that journal in the preceding three years. CiteScore metrics for a journal are published by Scopus once in a year. However, CiteScore tracker is updated every month and is a current indicator for a journal's performance.

(e) **Immediacy index:** Published by Thomson Reuter, Immediacy index is a measure of speed at which articles published in a journal are cited. Immediacy index is measured by the number of total citations of articles published in a given year divided by the number of total articles published in that year. Journals/issues that are published infrequently tend to have a relatively low Immediacy index and vice versa.

(f) **Cited half life:** Published by Thomson Reuter, Cited half life is an indicator of the median age of the articles that were cited in a Journal Citation Reports (JCR) year. Cited half life is available only for journals having 100 or more citations

in the JCR year. It is pertinent to mention here that cited half life is not a true indicator for a journal's performance.

(g) **H index:** Developed by Hirsch in 2005, this is a metric for evaluation of an individual scientist's performance based on his career publications rather than for a particular journal. If all publications of a scientist are arranged in the descending order of number of citations received till date, then H index is the highest number of articles, e.g. 'H' with citation number ≥ 'H'.[14] However, H index is known to have its own shortcomings.[8]

Discussion

Journal Impact Factor (JIF) has been widely used as a proxy marker for a journal's performance and ranking of journals for over five decades. There has been increasing dissent in academic circles regarding the accuracy of JIF as a journal prestige metric.[2–5] It is now widely believed that JIF is not a true indicator for a journal's performance because of the presence of inherent flaws/biases in the calculation of JIF as discussed above. It needs to be understood by the readers that average citation rates of articles published in a journal determines its Impact Factor (IF) and not vice versa. In contrast to popular belief, there is no guarantee that an article published in a high IF journal will attract high citations. There have also been increasing concerns about the growing misuse of the JIF in the last decade.[6] Growing demand for publications in 'high' IF journals have led to proliferation of unscrupulous agencies/companies projecting fake bibliometric indices in the garb of IF for unsuspecting aspiring researchers.[6]

Now may be the time for a discerning research and academic community to think beyond JIF. Besides the alternative metrics mentioned above, various editors/researchers have proposed many alternatives to traditional JIF from time to time. Yang et al. suggested an alternative Impact Factor (IF) with an ability to distinguish various types of citation distribution curves for citation information over three years which could complement the JCR IF.[8] Gasparyan et al. suggest a combined scientometric approach to complement the JIF with citation plots and alternative metrics pertaining to individual articles.[7] In a very recent and interesting editorial, Diamandis suggests a new name called Citation Average Per Citable Item (CAPCI factor) as an alternative to JIF as the author believes that most of the misuses of JIF are due to its name itself.[5]

Conclusion

It is important for a researcher to understand the pros and cons of the widely used and misused JIF. As an author/reader/researcher, one must evaluate an article after having gone through it in its entirety rather than by the name/fame of the journal. A journal should be evaluated by the quality of the individual articles rather than by the average number of citations in the journal which can be highly skewed. It is also important not to compare journals of different research fields based on their impact factor. Till the time, there is an ideal journal evaluation metric, the scientific community should explore the possibility of using various alternative metrics to JIF as detailed in this article.

Conflicts of interest

The author has none to declare.

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