

Absolute Impact Factor to Compare Journals and Research Publications of Different Subjects

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Abstract

The paper explores the problem of the parameter, Impact Factor for analyzing research publications of different subjects. A new tool, Absolute Impact Factor is introduced as analytical solution to bring journals of all subjects in a scale.

Keywords: Absolute Impact Factor, Impact Factor

1. Introduction

Impact Factor is one of the most common parameters to compare productivity of research. It also shows the importance of a journal. But it has been observed that impact factor in some subjects is very high compared to other subjects. This may be due to huge collaborative work in some subjects that forms some clusters in those subject areas. These clusters lead to generation of good number of citations and hence increase the impact factor. For example, impact factor of journals in biological sciences are high, whereas same in theoretical physics is quite low. Problem arises while comparing publications of researchers who are working on different subjects and for comparing importance of journals belonging to different subjects using impact factor. It is not appropriate to compare productivity and usefulness of research work in different subjects using the common parameter 'impact factor'. Within the same subjects, this comparison is fine. But among different subjects, it is a faulty method to compare journals of different subjects using impact factor. Therefore, this impact factor has to be recalibrated from subject to subject. In this paper the concept of absolute impact factor has been considered which recalibrates the impact factor for different subjects as per merit of the respective subjects and hence absolute impact factor measures the productivity of all subjects in same scale.

2. Review of Literature

Vogel studied impact factor and international collaboration of Chilean physics during the period of eight years (1987-1994). It was found that Chile did a remarkable progress in international collaboration and research in Physics (Vogel, 1997). Khan and Hegde discussed about advantages and limitations of impact factor. They gave emphasis on calculation and manipulation of impact factor (Khan & Hegde, 2009). Christensen and others tried to develop a method for online determination of journal impact factor (Christensen, Ingwersen & Wormell, 1997). Garg and others explored a technique to normalize impact factors of journals (Garg, Kumar & Dutt, 2011). Lin and others conducted bibliometric analysis for medicine departments in Taiwan taking data from MEDLINE database for the period 1990 to 2003. The study showed the impact of impact factor and the influence of SCI on the developing disciplines (Lin, et al., 2006). Contreras and others calculated long term impact factor of journals (from the year 1981-2003) using logistic diffusion model. They correlated long term impact factor with the current impact factor (Contreras, Gonzalo & Alaejandra, 2006). Egghe established a mathematical relation between uncitedness and impact factor. The uncitedness factor was calculated as the fraction of the research papers that were not cited in other journals (Egghe, 2008). Yu and

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others derived mathematical relation between Reliability-based citation impact factor (R-impact factor) (Kuo & Rupe, 2007) and impact factor. They showed that the R-impact factor was a much better concept than impact factor (Yu, Yang & Liang, 2010). Vanderelst and others found that research papers on the disease – ‘Neglected Tropical Zoonoses’ were published in journals having low impact factors though the published papers received good number of citations. The analysis showed that the journals having high impact factor did not show much interest on the disease, Neglected Tropical Zoonoses. They raised questions on publishing policies of medical science journals (Vanderelst, Speybroeck & Speybroeck, 2012). Bordons and others talked about advantages and limitations of impact factor. They pointed out that the journals of peripheral countries are not considered in the ISI databases. Therefore, research of different countries should be compared judiciously while using impact factor (Bordons, Fernandez & Gomez, 2002). Sombatsompop and others developed a modified method for calculation of impact factor. For the calculation of impact factor, 34 ISI journals on Polymer Science was considered during the period of 1997 – 2001 (Sombatsompop, Markpin & Premkamolnetr, 2004).

3. Impact Factor

The Impact Factor (IF) is the frequency at which the published articles of a journal are cited in a particular year. ‘IF’ is a parameter to measure the importance and productivity of any journal.

Following is the formula to find out Impact Factor of a journal (J) for the year 2017:

C_{2017} is the total number of citation received by the articles published in the years 2015 and 2016 in the journal J during the year 2017

P is the total number of articles published in the years 2015 and 2016 in the journal J

$$P = P_{2015} + P_{2016}$$

Impact Factor of journal J for the year 2017:

$${}^{IF}J_{2017} = C_{2017} / P$$

4. Absolute Impact Factor

Universe of knowledge is collection of different subjects. Universe of knowledge is considered as universal set U. The universal set, U is having as elements different subject areas:

$$U = \{S_1, S_2, S_3, \dots, S_i\} \quad (i = 1, 2, 3, \dots)$$

Where set elements $S_1, S_2, S_3, \dots, S_i$ are different subject areas like Astrophysics, Material Sciences, Chemistry, Statistics etc.

Each subject set S_i has some journals (J_n) in that subject area as set elements.

$$S_i = \{J_1, J_2, J_3, \dots, J_n\} \quad (n = 1, 2, 3, \dots)$$

The sets U and S are open sets; they have flexibility to include any element to cope with the growth of knowledge.

Journal having high impact factor is considered as J_{max} and that having low impact factor as J_{min} . So highest impact factor journal of subject S_i is written as ${}^{S_i}J_{max}$ and that of lowest impact factor journal is ${}^{S_i}J_{min}$.

Let us consider the subject S_i having the SCI indexed journals.

$$S_i = \{J_1, J_2, J_3, \dots, J_n\}$$

Maximum impact factor of the journal in the subject is ${}^{S_i}J_{max}$ and that of minimum impact factor is ${}^{S_i}J_{min}$

If impact factor of the journals in the subject S_i are:

$${}^{S_i}J_{1F}, {}^{S_i}J_{2F}, {}^{S_i}J_{3F}, \dots, {}^{S_i}J_{nF}$$

${}^{S_i}J_{nF}$ moves within the domain between ${}^{S_i}J_{max}$ and ${}^{S_i}J_{min}$

Sum of impact factor of all journals belonging to the subject S_i is:

$$T_{S_i} = \sum_{i=1}^n {}^{S_i}J_{iF}$$

Now Average impact factor of the journal in the subject S_i is:

$${}^{S_i}J_{avg} = T_{S_i} / n$$

Therefore, Absolute impact factor of any journal is:

$${}^{S_i}J_{1\text{ absolute}} = {}^{S_i}J_{IF} / {}^{S_i}J_{avg}$$

In general, this can write as:

$${}^{S_j}J_{i\text{ absolute}} = {}^{S_j}J_{iF} / {}^{S_j}J_{avg}$$

$$i = 1, 2, 3, \dots, n$$

$$j = 1, 2, 3, \dots, m$$

Absolute Impact Factor is a measure of journals which defines how good a journal is in its own subject area. It shows the standing of a journal in its subject domain.

For a sample study, journals published by Springer have been considered (<https://www.springer.com/gp/impact-factor-2017>). Impact Factors for the year 2017 and Absolute Impact Factors have been compared side by side.

Subject: Astrophysics

Astronomy	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Living Reviews in Solar Physics	12.833	2.85
2.	The Astronomy and Astrophysics Review	11.611	2.58

3.	Space Science Reviews	9.327	2.07
4.	Solar Physics	2.580	0.57
5.	Celestial Mechanics and Dynamical Astronomy	2.121	0.47
6.	Astrophysics and Space Science	1.885	0.41
7.	Experimental Astronomy	1.349	0.30
8.	Astrophysical Bulletin	1.290	0.28
9.	Astronomy Letters	1.160	0.25
10.	Radiophysics and Quantum Electronics	0.921	0.20

$$J_{\text{avg}} = 4.50$$

Absolute impact factor of journal 'Living Reviews in Solar Physics'

$$J_{\text{absolute}} = 12.83 / 4.50 \\ = 2.85$$

Subject: Chemistry

Chemistry	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Microchimica Acta	5.705	1.66
2.	Topics in Current Chemistry	5.537	1.61
3.	Science China Chemistry	4.448	1.30
4.	Cellulose	3.809	1.11
5.	Analytical and Bio-analytical Chemistry	3.307	0.96
6.	Journal of Bioenergetics and Biomembranes	2.914	0.85
7.	Plasma Chemistry and Plasma Processing	2.658	0.77
8.	Chinese Journal of Polymer Science	2.016	0.58

9.	Journal of Polymers and the Environment	1.971	0.57
10.	Journal of Porous Materials	1.858	0.54

$$J_{\text{avg}} = 3.42$$

Subject: Philosophy

Philosophy	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Journal of Business Ethics	2.917	1.84
2.	Agriculture and Human Values	2.568	1.62
3.	Science and Engineering Ethics	1.859	1.17
4.	Medicine, Health Care and Philosophy	1.407	0.89
5.	Biology & Philosophy	1.311	0.82
6.	European Journal for Philosophy of Science	1.295	0.81
7.	Journal of Agricultural and Environmental Ethics	1.240	0.78
8.	Neuroethics	1.214	0.76
9.	Argumentation	1.114	0.70
10.	NanoEthics	0.950	0.60

$$J_{\text{avg}} = 1.58$$

Subject: Economics

Economics	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Journal of Economic Growth	6.480	2.72
2.	Transportation	3.151	1.32
3.	Networks and Spatial Economics	2.695	1.13

4.	Experimental Economics	2.267	0.95
5.	Environmental and Resource Economics	1.961	0.82
6.	Journal of Risk and Uncertainty	1.886	0.79
7.	Journal of Cultural Economics	1.676	0.70
8.	Open Economies Review	1.368	0.57
9.	Journal of Economic Interaction and Coordination	1.250	0.52
10.	Economic Theory	1.108	0.46

$J_{avg} = 2.38$

Subject: Biomedical Sciences (Cancer Research)

Biomedical Sciences (Cancer Research)	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Cancer and Metastasis Reviews	6.081	1.78
2.	Cellular Oncology	4.761	1.39
3.	Angiogenesis	4.351	1.27
4.	Apoptosis	3.967	1.16
5.	Clinical & Experimental Metastasis	3.455	1.01
6.	Cancer Causes & Control	2.728	0.80
7.	Familial Cancer	1.943	0.56
8.	Pathology & Oncology Research	1.935	0.56
9.	Journal of Cancer Education	1.547	0.45

$J_{avg} = 3.41$

Subject: Biomedical Sciences (Human Genetics & Physiology)

Biomedical Sciences (Human Genetics & Physiology)	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Journal of Molecular Medicine	4.938	1.64
2.	Human Genetics	3.930	1.30
3.	BioDrugs	3.825	1.27
4.	Cell and Tissue Research	3.043	1.01
5.	Pflügers Archiv - European Journal of Physiology	2.765	0.91
6.	The Journal of Physiological Sciences	2.757	0.91
7.	Molecular Diagnosis & Therapy	2.716	0.90
8.	European Journal of Applied Physiology	2.401	0.79
9.	Medical & Biological Engineering & Computing	1.971	0.65
10.	European Cytokine Network	1.720	0.57

$J_{avg} = 3.01$

Subject: Biochemistry

Biochemistry	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Metabolomics	3.511	1.37
2.	Calcified Tissue International	3.293	1.29
3.	JBIC Journal of Biological Inorganic Chemistry	2.952	1.15

4.	Amino Acids	2.906	1.14
5.	Molecular and Cellular Biochemistry	2.561	1.00
6.	BioMetals	2.478	0.97
7.	Biological Trace Element Research	2.361	0.92
8.	European Biophysics Journal	1.935	0.76
9.	Molecular Biology Reports	1.889	0.74
10.	The Journal of Membrane Biology	1.638	0.64

$$J_{avg} = 2.55$$

Subject: Statistics

Statistics	Journal Name	Impact Factor (2017)	Absolute Impact Factor
1.	Statistics and Computing	1.851	1.51
2.	Advances in Data Analysis and Classification	1.653	1.35
3.	Extremes	1.368	1.12
4.	Journal of Classification	1.214	0.99
5.	TEST	1.183	0.96
6.	Journal of Agricultural, Biological and Environmental Statistics	1.072	0.87
7.	Statistical Papers	1.024	0.83
8.	Lifetime Data Analysis	1.000	0.81
9.	Metrika	0.948	0.77
10.	Statistical Methods & Applications	0.932	0.76

$$J_{avg} = 1.22$$

From the data it is observed that there is a big difference

in Impact Factor of journals of different subjects like Astrophysics, Economics, and Statistics etc. For the sake of comparison one good journal from each of two subjects like Astrophysics and Statistics have been considered below:

Subject: Astrophysics

Journal Name	Impact Factor (2017)	Absolute Impact Factor
Living Reviews in Solar Physics	12.833	2.85

Subject: Statistics

Journal Name	Impact Factor (2017)	Absolute Impact Factor
Statistics and Computing	1.851	1.51

Both the journals “Living Reviews in Solar Physics” and “Statistics and Computing” are very good journals in their respective subject domains. But “Living Reviews in Solar Physics” is having Impact Factor: 12.833 whereas “Statistics and Computing” is having Impact Factor: 1.851. Now, to infer that “Living Reviews in Solar Physics” is a much better journal compared to “Statistics and Computing” would not be appropriate. Whereas Absolute Impact Factor has reduced this gap and provides a better measure of quality of a journal across different domains.

5. Conclusion

It is proposed here that Absolute Impact Factor is a useful and more reliable parameter to compare quality of journals in different subjects.

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