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07. October 2009

Online at <http://mpra.ub.uni-muenchen.de/17712/>  
MPRA Paper No. 17712, posted 07. October 2009 / 19:06

## Does the Journal Impact Factor help make a Good Indicator of Academic Performance?

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**I. Introduction:** After the notification of the *University Grants Commission (Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education) Regulations, 2009* (called the UGC Regulations hereinafter) on September 23<sup>rd</sup> 2009, publication of research papers/articles in reputed journals has become an important factor in assessment of the academic performance of teachers in colleges and universities in India. One of the measures of reputation and academic standard (rank or importance) of a journal is the so-called 'Impact Factor', which, with some qualifications, is the average number of citations for papers published in a particular journal. It is obtained as the ratio of the total number of citations papers in the journal receive to the number of papers published in the journal. The impact factor was devised by Eugene Garfield. Garfield is the founder of the Institute for Scientific Information (ISI), which is now part of Thomson Reuters. Impact factors are calculated annually for those journals that are indexed in Thomson Reuter's *Journal Citation Reports*. However, *Journal Citation Reports* covers science subjects more exhaustively and includes only a few social science journals. Therefore, in social sciences, other organizations are doing this job; for example, RePEc does the job of computing the impact factor of journals in economics.

The computation of impact factor uses a simple formula. As described in the Wikipedia, in a given year, the impact factor of a journal is the average number of citations to those papers that were published during the two preceding years. For example, the 2007 impact factor of a journal would be calculated as follows:

A = the number of times articles published in 2005 and 2006 were cited by indexed journals during 2007

B = the total number of "citable items" published in 2005 and 2006. ("Citable items" are usually articles, reviews, proceedings, or notes; not editorials or Letters-to-the-Editor.)

2007 impact factor =  $A/B$

Note that 2007 impact factors are actually published in 2008; it cannot be calculated until all of the 2007 publications had been received by the indexing agency.

The UGC Regulations assign different level of importance to the impact factors in the natural science/engineering and the humanities/arts/social science streams of higher education. For this purpose, they classify Engineering, Agriculture, Veterinary Science, Sciences and Medical Sciences in one category and Languages, Arts, Humanities, Social Sciences, Library, Physical education, and Management in the other category. Table-1 shows how the UGC Regulations assign importance to impact factors in these two categories.

On this account several questions can be and have been raised from different corners. Some view it as a discrimination against the "sciences" and favour to the non-sciences (without any disparaging connotation, of course). Others think that even within the 'sciences' there is so much of difference in the journal impact factors that no single yardstick can be used to assign importance to them. In support of their argument they point out that there are few journals in mathematics that have an impact factor above 5.0 while such journals abound in life sciences. There are still others who think that instead of

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using the crude journal impact factor for assessment of importance, one should use the ‘normalized’ impact factor and possibly, the average impact factor (computed over, say, five best journals in the discipline) may be considered as 100.0 and other journal impact factors (in the discipline) should be normalized with respect to that such that all journals in the discipline score between zero and 100.0. And lastly, there are many who believe that the journal impact factor, as it has been defined, is a surely misleading indicator of academic importance especially when the inter-disciplinary comparisons are made.

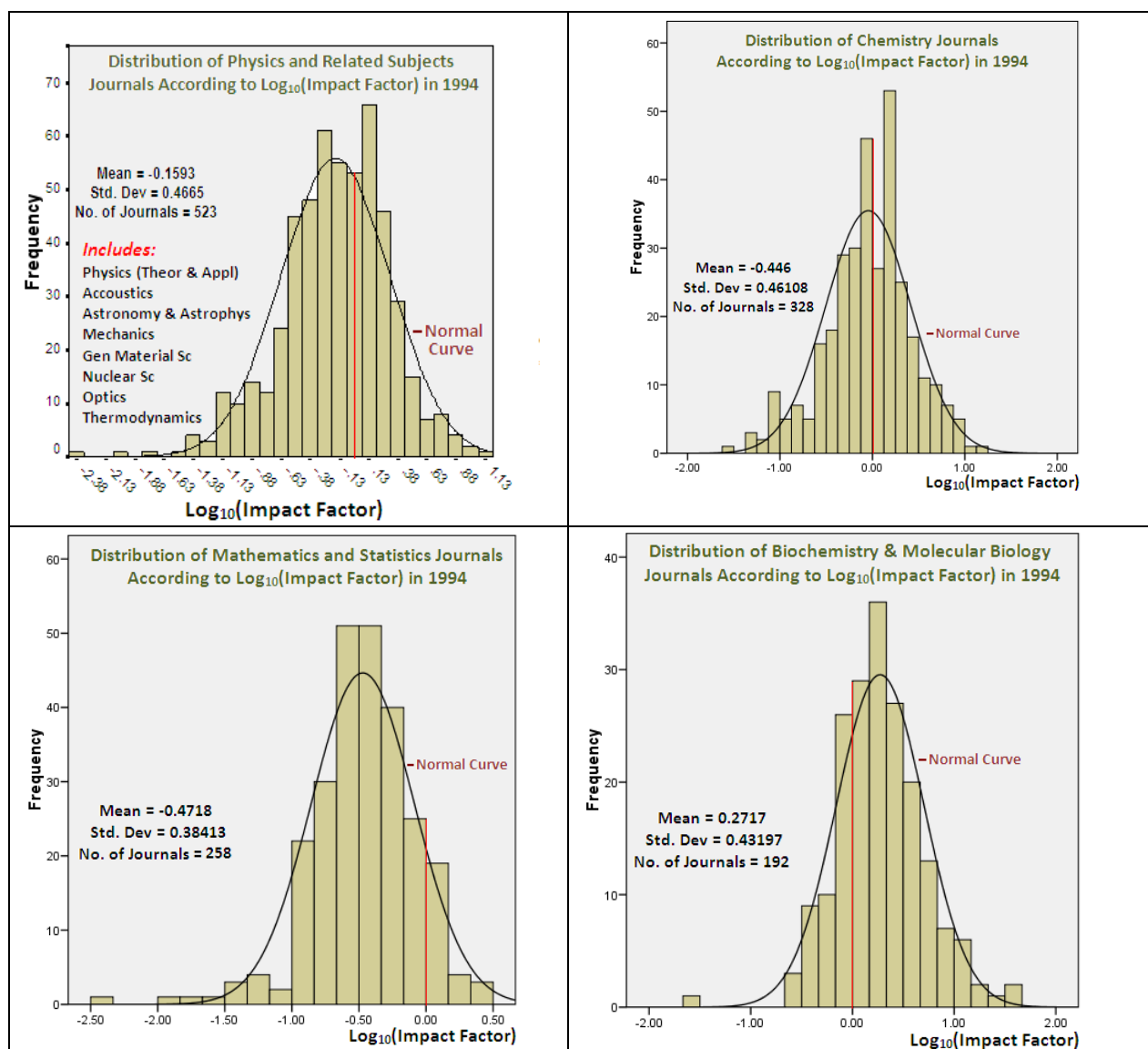
<b>Table-I: Relative Weightage assigned to Impact Factors (IF) in the Different Categories of Disciplines</b>		
<b>Engineering/Agriculture/Veterinary Science/ Sciences / Medical Sciences [The Sciences Category]</b>	<b>Languages, Arts/ Library/ Humanities/ Social Sciences/ Physical education/ Management [The Non-Sciences Category]</b>	<b>Max. points for University and college teacher position</b>
Refereed and indexed Journals with impact factor 0.0 but less than 1.0	Refereed Journals which are <i>not indexed</i> and thus have no impact factor	15 per publication
Refereed Journals with impact factor 1.0 and below 2.0	Refereed Journals which are indexed publications with Impact factor less than one	20 per publication
Refereed Journals with impact factor 2.1 and below 5.0	Refereed Journals with impact factor 1.0 and below 2.0	30 per publication
Refereed Journals with impact factor 5.1 and below 10.0	Refereed Journals with impact factor 2.0 and below 5.0	40 per publication
Vernacular & Indian language journals in all disciplines without any impact factors included in the list of journals prepared by UGC and hosted in its website	Vernacular & Indian language journals in all disciplines without any impact factors included in the list of journals prepared by UGC and hosted in its website	10 per Publication
Non impact factor National level research papers in non-refereed/ journals but having ISBN/ISSN numbers and the list of journals prepared by UGC and hosted in its website.	National level research papers in non-refereed/non Journals but having ISBN/ISSN numbers and the list of journals prepared by UGC and hosted in its website.	10 per publication
Full papers in conference proceedings, etc. (Abstracts not to be included)	Full papers in Conference proceedings, etc. (Abstracts not to be included)	10 per publication
Note: Class intervals of IF as given in the UGC Regulations; obviously, faulty – what if the IF lies in the interval [2, 2.1) ?		

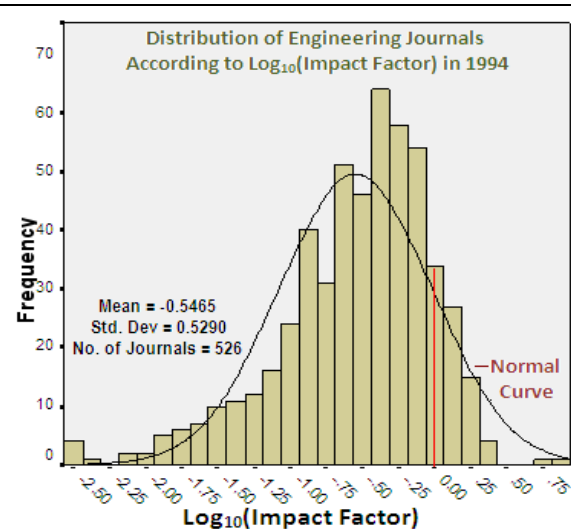
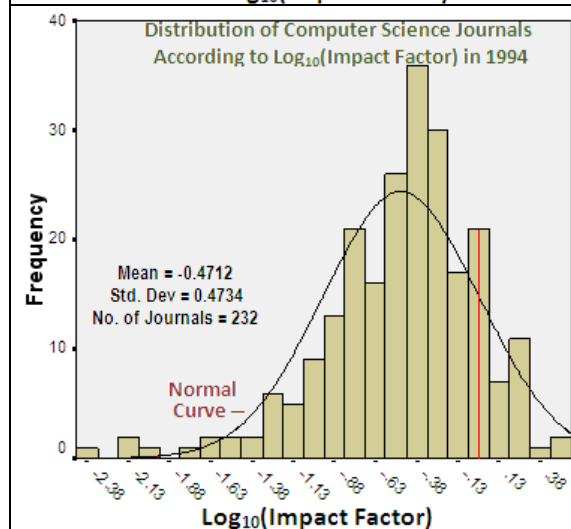
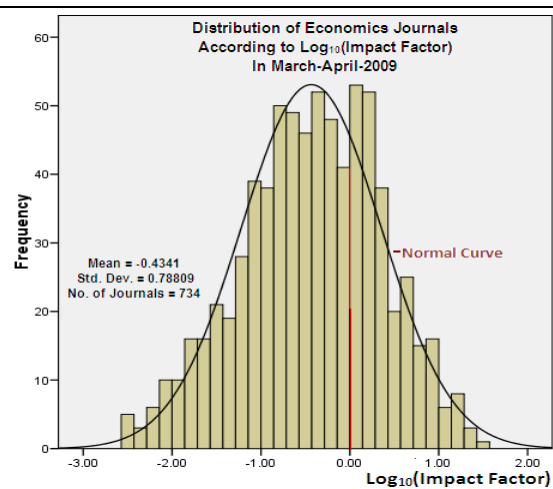
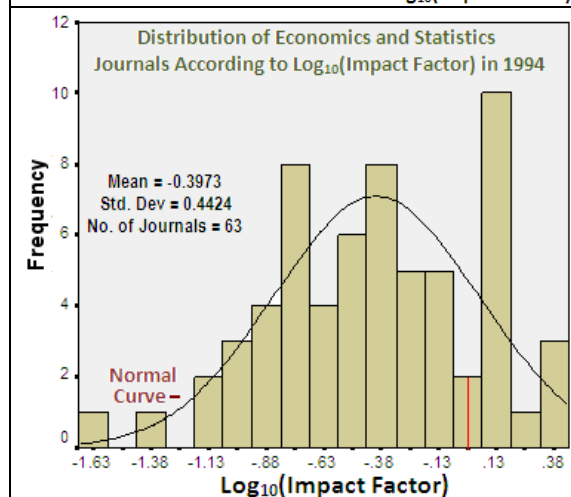
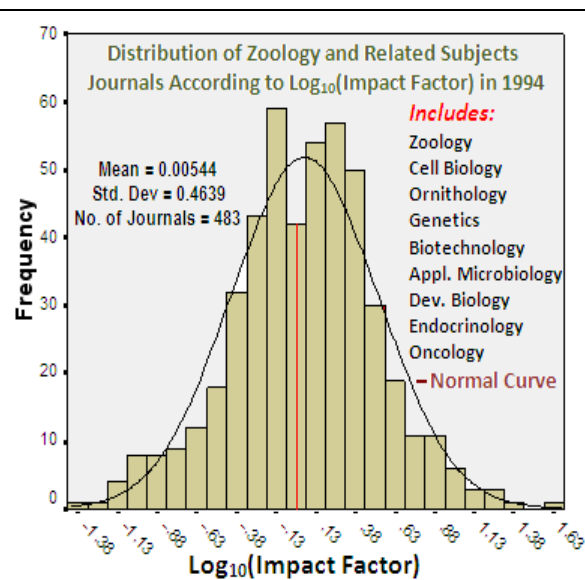
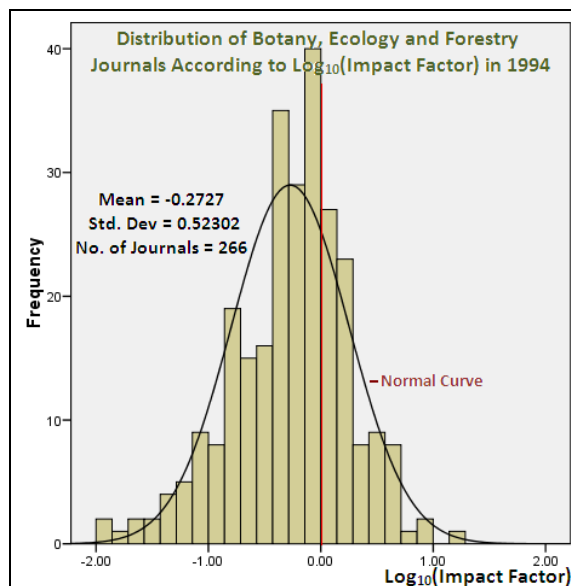
**II. What Do the Statistics Say:** We have collected some data on the Journal impact factors for two points in time; for the year 1994 (source: <http://www.mkk.szie.hu/~fulop/Res/If/If.htm>) and for the year 2006 (source: <http://www.icast.org.in/Impact/subject2006.html>). We have been constrained by unavailability of data especially in the ‘non-sciences’ and therefore we have used the data for the year 2002 (Source: [http://www.staff.city.ac.uk/~sj361/here\\_you\\_can\\_see\\_an\\_excel\\_spread.htm](http://www.staff.city.ac.uk/~sj361/here_you_can_see_an_excel_spread.htm)). For Economics, the *Internet Documents in Economics Access Service* (IDEAS) journal impact factors are available and are updated regularly (<http://ideas.repec.org/top/top.journals.simple.html>). We assume some sort of stability in the journal impact factor (without which assumption it loses all its value) and thus, in spite of the obvious limitations, we venture upon comparing them.

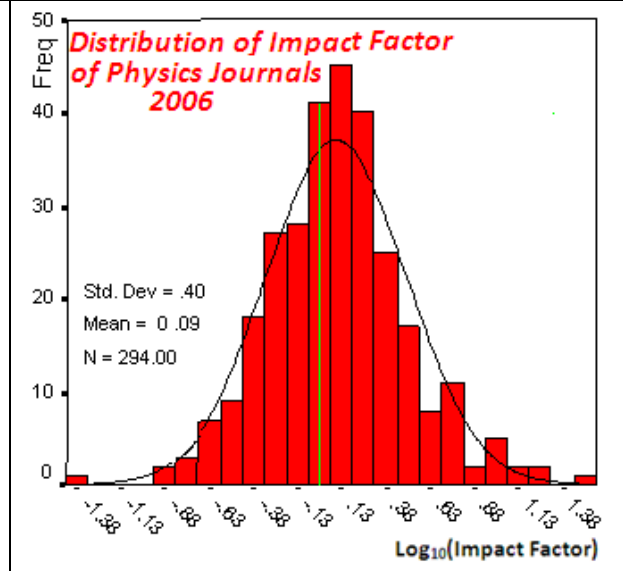
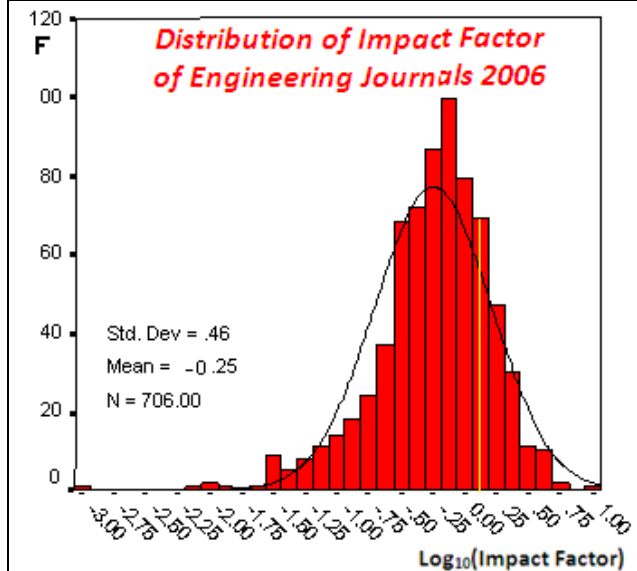
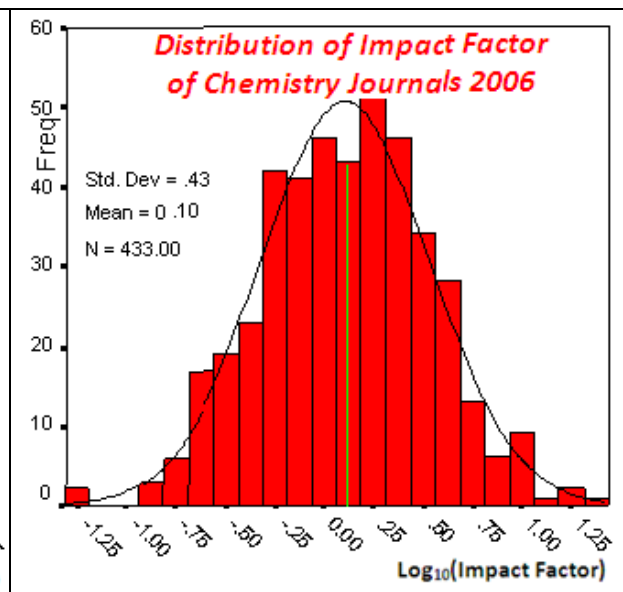
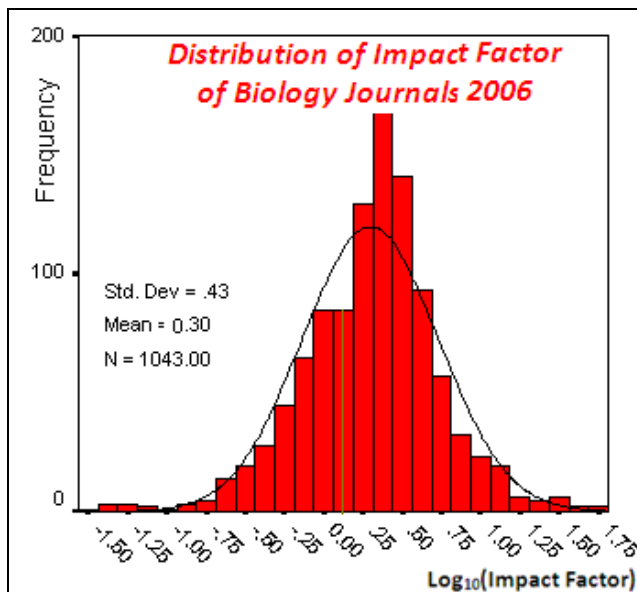
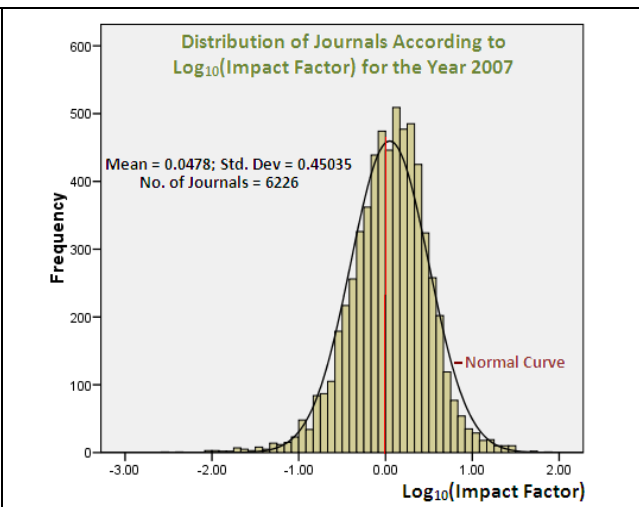
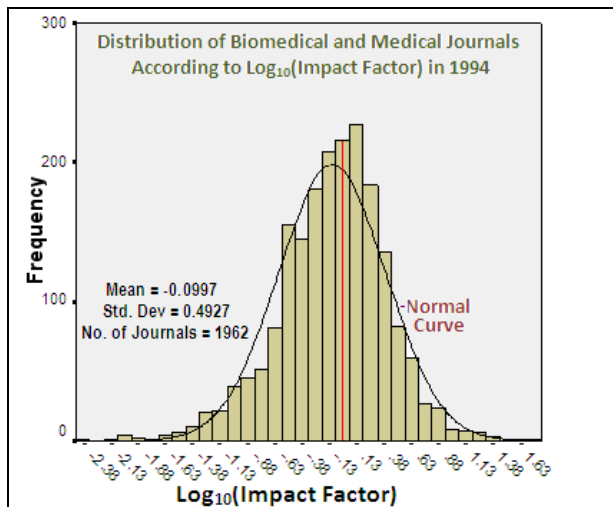
Methodologically, we have used mean and standard deviation of the ( $\log_{10}$  transformation of) journal impact factors and their frequency distribution to arrive at the conclusions. The Frequency Distributions across the subject groups reveal that in engineering, mathematics, computer science, economics, and the social sciences the distributions of journal impact factors are positively skewed, meaning thereby that the mean lies to the left of the median. On the other hand, in subject-groups such as biology, especially the molecular biology and biochemistry, the distribution is very much negatively skewed. Even within the life sciences, botany, ecology and forestry impact factors have a positive skewness (see graphs).

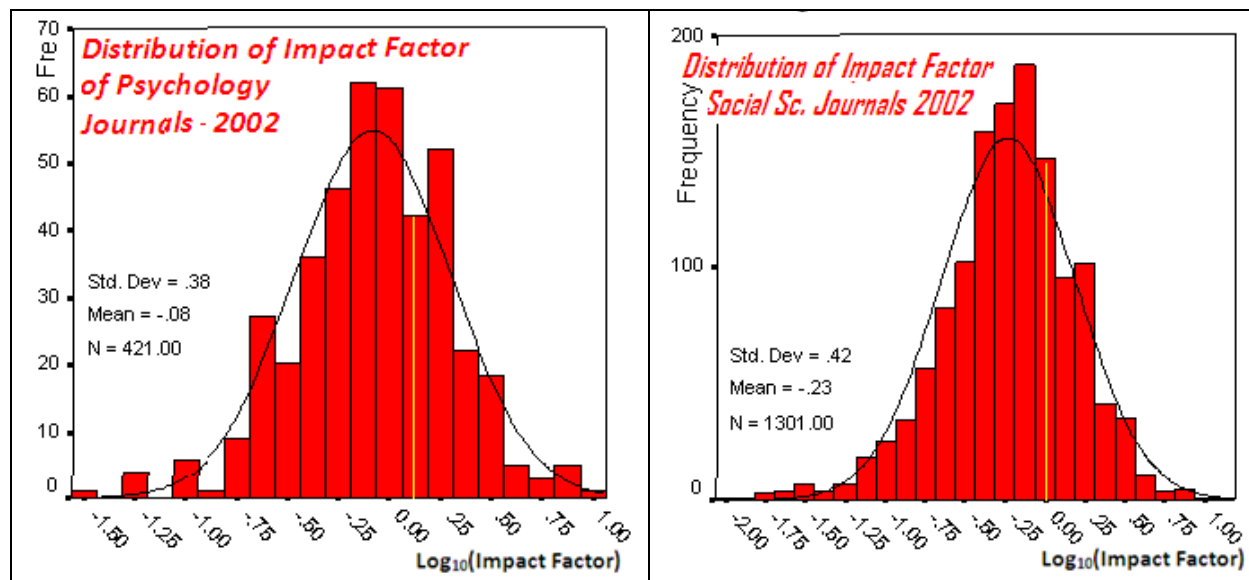
**III. Does the Impact Factor Provide an Accurate Measure of a Journal's Importance?** In counting citations, only papers published in the past two years are considered. In fact, many papers are appreciated after several years of their publication and then referred and many other papers continue influencing others' research for much longer period. Also, items such as news articles and editorials that are the regular features of some journals are not counted in the denominator of the impact factor, but citations to those news articles may be included in the numerator, inflating the impact factor of journals that publish such articles.

Review articles are often much more highly cited than the average original research paper, so the impact factor of review journals can be quite high. In some fields, there have been reports of journals that have manipulated [1] their impact factors by such tactics as adding news articles, accepting papers preferentially that are likely to raise the journal's impact factor, or even asking authors to add citations to other articles in the journal.









**IV. Should the Journal Impact Factor be Used to Evaluate an Individual publication or Researcher?** As pointed out in the Wikipedia, “the impact factor is often misused to evaluate the importance of an individual publication or evaluate an individual researcher [2]. This does not work well since a small number of publications are cited much more than the majority - for example, about 90% of Nature's 2004 impact factor was based on only a quarter of its publications, and thus the importance of any one publication will be different and on the average less than the overall number [3]. The impact factor, however, averages over all articles and thus underestimates the citations of the most cited articles while exaggerating the number of citations of the majority of articles. Consequently, the Higher Education Funding Council for England was urged by the House of Commons Science and Technology Select Committee to remind Research Assessment Exercise panels that they are obliged to assess the quality of the content of individual articles, not the reputation of the journal in which they are published [4].“

If journal impact factor is used to assess the academic performance of individuals (for the purpose of selection, promotion, etc) and it is not borne in mind that due to vast differences in the nature of distribution of impact factors across the disciplines they are not justifiably comparable, a below average scholar in the one discipline (wherein the journal impact factor is negatively skewed) will rank higher and will be honored (and benefitted) more than another scholar in some other discipline (wherein the journal impact factor is positively skewed). It may be noted that even in the university departments there are specializations with low impact factor journals and other specializations with very high impact factor journals. But the teachers/researchers of different specializations in the departments compete with each other for promotion. Will the researchers with an unfortunate specialization (wherein the journal impact factor is positively skewed) receive justice on such criteria?

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