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SAVVY SEARCHING

Five-year impact
factor

Five-year impact factor data in the *Journal Citation Reports*

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603

Abstract

Purpose – The purpose of this paper is to examine the five-year journal impact factor (JIF) score of the *Journal Citation Reports (JCR)*.

Design/methodology/approach – The paper looks at one of the important enhancements to the *JCR*, the new five-year journal impact factor (JIF) score. This element complements the traditional JIF scores and data. The new indicator addresses the criticism against the short citation window for evaluating the performance of nearly 8,000 scholarly and professional journals on a medium term.

Findings – It may be feasible that some of the other proposals presented by the best scientometricians for improving the JIF and its alternatives will be implemented in various specialty editions of *JCR*. Particularly interesting would be the adding of scores computed through diachronous instead of or in addition to synchronous measurement; creating new indicators based on the level of uncitedness of articles in journals; and calculating percentile JIF, JIF point averages and/or JIFs based on article count, with or without self-citations.

Originality/value – The five-year mid-term JIF complements very well the short-term two-year JIF for indicating the prestige, reputation and influence of the journals through the prism of the average productivity of journals and the citedness counts of articles published in the journals for a longer time span. As mentioned above, breaking down the various indicators by disciplinary and subdisciplinary categories, or even by the language and the country of publication of the journals (not the country affiliation of the authors) can provide further insight into the landscape of scholarly publishing.

Keywords Serials, Reports

Paper type Viewpoint

The *Journal Citation Reports (JCR)* are regularly released on the web and on CD in the middle of every year. The 2007 edition was released in July 2008, then re-issued in January 2009. The reason for this unusual step was that there were important enhancements to the *JCR*, one of which, the new five-year journal impact factor (JIF) score, is the focus of this paper. This element complements the traditional JIF scores and data (although not in every regard). The new indicator addresses the criticism against the short (for some disciplines, indeed too short) citation window for evaluating the performance of nearly 8,000 scholarly and professional journals on a medium term. The *JCR* was also enhanced with two additional, potentially useful indicators – the eigenfactor and article influence factor scores, also on a five-year basis. These will be the subject of a sequel to this paper.

Background

The JIF and other performance indicators used in bibliometrics, scientometrics, informetrics, webometrics and other terms with the suffix “metrics” can excessively irritate many scientists and administrators, as much as telemetrics raised the ire of the



cardinals. It is quite telling that just as I was working on this paper and was re-reading many of the best metrics papers, the title of the recent editorial in *Current Science* caught my eye. It read: “Scientometrics – a dismal science” (Balaram, 2008).

This was from the well-known and influential editor and publisher of an important Indian journal in which many scientometricians of India, and indeed from both the Western and Eastern hemispheres, have published papers about informetric issues, including the JIF. These authors include Subbiah Arunachalam, who has published essential and insightful scientometrics papers about the status of research in India, China and the Asia region (Arunachalam, 2002, 1998, 1997). I felt sensitive also for a personal reason because my invited paper was published in the issue of the journal – edited by Professor Arunachalam – that paid homage to Eugene Garfield on his 80th birthday, and it became my second most cited paper (Jacsó, 2005), but admittedly it ranked only as 37th among the 29,000 papers of the journal covered by Web of Science (WoS).

The topic of calculating the JIF has remained especially controversial since the publication of the idea more than 40 years ago (Garfield and Sher, 1963; Garfield, 2006). Originally, it was developed to help in selecting the set of the most influential core journals in natural and applied sciences to be covered by the *Current Contents* publication (Garfield, 2006). Beyond the obvious importance of currency, the feasibility of the expense and time requirements of such a project must have been the ultimate reason for selecting a two-year citation window, and a one-year citing window. Even today, producers of far smaller databases, using far more sophisticated hardware and software resources, hesitate to engage in projects to enhance indexing/abstracting records with cited references for reasons of the expense. That’s why PsycINFO chose a short time span for the retrospective enhancement of its records, and Elsevier decided to offer such records in Scopus only from 1996 onward. The two-year citation window remained the choice when Garfield’s company, the Institute for Scientific Information (ISI), kept growing at a remarkable pace, parallel to the increase of interest in the print, CD-ROM and online products and services it offered. It remained so even after the Thomson Group acquired the company in 1992.

Throughout this time the JIF has been computed as the ratio of the citations received by the journals in a given year (Y) to items published in the previous two years (Y-1 and Y-2), and the number of “citable items” published in the journal in the same period. I use the term “items” intentionally, as documents are classified into genres (regular articles, literature review articles, and various miscellaneous materials ranging from book reviews to corrections), and only the first two types of items are counted for the denominator. This may distort the impact factor when “non-citable” items in a small volume journal are indeed cited (Moed and van Leeuwen, 1995; Jacsó, 2001). This problem triggered my (admittedly) vindictive column in *Online Information Review*, when I found that *Contemporary Psychology*, a journal of “non-citable” book reviews, catapulted to the No. 1 position, not only in the Psychology category but in the entire Social Sciences section of the *JCR*, with a JIF score of 10 (Jacsó, 2000). It puts the issue into perspective that even in the most current 2007 *JCR* edition, only three of the 447 journals in the 10 Psychology subcategories reached such a high two-year JIF (JIF-2), and six in the five-year JIF (JIF-5) rank list.

The *JCR* database has been a standard item in the digital collections of academic and special libraries in most developed countries. It is quite telling that a quick and

dirty search in the title, keyword and abstract fields brings up nearly 900 hits using the terms impact factor* AND citation* (using this latter word to filter out papers about non-scientometric impact factors) in Scopus (which has more abstracts than WoS).

There has been also quite a number of papers that have levied criticism against the *JCR* in general, and specifically against the JIF for a variety of reasons. These include such arguments as the lack of coverage of books, the modest coverage of conference proceedings, non-English language and regional journals, the logic of assignment of journals to subject categories and subcategories, the omission of serials of international importance, the inclusion of journals with questionable importance in the *JCR*, as well as the implications of the highly skewed distribution of citations among the papers published in a given journal, the neglect of the influence of the self-citation rate, the determination of the citable documents, the different citation culture in disciplines, and the shortness of the two-year citation window.

Although some of the criticism is justified, it is surprising to see the emotionally overloaded tabloid-style headlines about the flaws of JIF in academic journals such as *Nature*, *Lancet*, *Epidemiology* and *Journal of Joint and Bone Surgery*, as illustrated in the sample list below:

- “Beware the tyranny of impact factors”.
- “Challenging the tyranny of impact factors”.
- “Corruption of journal impact factors”.
- “Impact factors ‘flawed, misleading and unfair’”.
- “Journal impact factors for the individual scientist: an unnecessary evil”.
- “Let’s dump the factors”.
- “Nightmare impact factor”.
- “The dreaded impact factor is back to haunt us!”.
- “The impact factor – ‘Misleading, unscientific and unjust’”.
- “The impact factor – what it is and where it is useless”.
- “The journal ‘impact factor’: a misnamed, misleading, misused measure”.
- “The malign influence of impact factors”.
- “The perfidy of impact factors”.
- “The tyranny of the impact factor”.
- “Worshipping false idols: the impact factor dilemma”.

Fortunately, there are three excellent sources that cover very well the literature related to impact factors directly or indirectly – Wilson (1999), Bar-Ilan (2008) and Pendlebury (2009) – and jointly they cover the entire relevant period up to the moment. The extensive reference lists together with the illuminating, clear and objective reviews of the main issues and publications are like the best prepared tour guides in discovering the best spots in the jungle – leading us to the most relevant sources, and skipping the less important ones.

However, the brunt of these criticisms should be directed at the wrong practice of researchers and administrators, who misuse the JIF as a proxy for judging the performance of research centres, universities and individual researchers based on the JIF scores of the journals in which their papers were published, rather than on the

merits of the papers. Similarly, there are many who seemingly use it as intended – to aid the process of journal collection management, but who only look up the JIF scores, and ignore (or do not understand sufficiently) the other indicators presented in *JCR*, such as the immediacy index, the cited and citing half-life indicators and their time-series data, or the journal-level self-citation rate. These are available in the *JCR* exactly for the purpose of putting the JIF scores in context. They should and can be used smartly in practice, as is demonstrated by Ketcham (2008) and Nisonger (2000).

The other reason for the often much overheated and exaggerated criticism may be that, laudably, the algorithm for calculating the JIF is transparent and can be corroborated based on the data presented in *JCR*. This is in contrast to the alternative single number scores presented by some alternative websites that will be discussed in the sequel to this paper.

Much more useful are the substantial papers that not only criticise and dismiss *in toto* the *JCR* and the concept and practice of JIF, but also explain the context and the multidimensional nature of the JIF, recommend a balanced approach to using statistical indicators (e.g. Bornmann *et al.*, 2008; Glänzel, 2009; Butler, 2008; McVeigh, 2004), offer suggestions and demonstrate alternatives, show the pros and cons of using statistical measures that always need careful interpretation, and remind us that scores and rank lists should be always checked for possible errors and validated against peer ranking (e.g. Harnad, 2008; Leydesdorff, 2008; Moed *et al.*, 1985; Nisonger, 1994, 2004; Rousseau, 2001; Seglen, 1997).

The major features of the five-year JIF

Garfield (1990) demonstrated 20 years ago the difference between two-year and five-year JIFs, and how they change the list and rank order of the top 25 journals by the highest JIFs for the two timeframes. He then extended it by computing the 15-year, seven-year and two-year JIFs to create a list of the top 100 journals (Garfield, 1998) to see the changes in the cumulative JIFs and in the rank order of the journals.

Although the size of the *JCR* kept increasing year by year, no alternative indicators were introduced until early 2009, when the enhanced version of the 2007 edition was released. It included the additional five-year JIF score (and two other indicators, not shown and discussed here in order to keep the focus). Figure 1 shows an excerpt of the list for the Information and Library Science category of the 2007 enhanced edition. The name of the traditional JIF did not change, but it would help the casual user if it were renamed the “2-Year Impact Factor”.

The list, which can be sorted by any of the data elements, is well designed and it is good that the extra information could be squeezed into the existing screen area very well. It would be even more useful to show the number of citable items and the number of citations received for the previous five years than the ISSN, which could be relegated to the details screen. At this stage any other indicator is much more important to the users than the ISSN. It may be better to have a flip-flop summary screen, one to show up front the JIF-2 and JIF-5 scores, and the summary data related to calculating them (such as the total number of citable documents and citations for two years and five years), and another to show the cited half-life, the immediacy index (in a narrower column), and the data series related to these indicators.

Splitting the summary list into two screens could also accommodate a rank column that would readily indicate significant changes between the rank positions of the

WELCOME HELP RETURN TO LIST 2007

Marked Journal List

Sorted by: Impact Factor SORT AGAIN

Journals 1 - 20 (of 51) [1 | 2 | 3]

CLEAR MARKED LIST UPDATE MARKED LIST SAVE TO FILE FORMAT FOR PRINT Ranking is based on your journal

Mark	Rank	Abbreviated Journal Title (linked to journal information)	ISSN	JCR Data ⁱ					
				2007 Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	2007 Items	Cited Half-life
<input checked="" type="checkbox"/>	1	MIS QUART	0276-7783	4329	5.826	9.257	0.533	30	9.4
<input checked="" type="checkbox"/>	2	J AM MED INFORM ASSN	1067-5027	2394	3.094	3.489	0.699	93	5.2
<input checked="" type="checkbox"/>	3	INFORM SYST RES	1047-7047	2146	2.682	6.579	0.130	23	8.3
<input checked="" type="checkbox"/>	4	ANNU REV INFORM SCI	0066-4200	378	1.963	2.810	0.533	15	6.1
<input checked="" type="checkbox"/>	5	J MANAGE INFORM SYST	0742-1222	1861	1.867	3.229	0.175	40	7.7
<input checked="" type="checkbox"/>	6	J HEALTH COMMUN	1081-0730	709	1.836	2.021	0.136	44	4.0
<input checked="" type="checkbox"/>	7	INT J GEOGR INF SCI	1365-8816	1410	1.822	2.068	0.186	59	8.4
<input checked="" type="checkbox"/>	8	INFORM MANAGE-AMSTER	0378-7206	1833	1.631	2.756	0.127	55	6.0
<input checked="" type="checkbox"/>	9	J INF TECHNOL	0268-3962	477	1.605	2.045	0.086	35	6.3
<input checked="" type="checkbox"/>	10	INFORM SYST J	1350-1917	380	1.531	2.085	0.611	18	6.2
<input checked="" type="checkbox"/>	11	INFORM PROCESS MANAG	0306-4573	1441	1.500	1.639	0.211	109	7.9
<input checked="" type="checkbox"/>	12	SCIENTOMETRICS	0138-9130	1515	1.472	1.538	0.147	129	5.7
<input checked="" type="checkbox"/>	13	J AM SOC INF SCI TEC	1532-2882	3026	1.436	1.840	0.409	186	7.7
<input checked="" type="checkbox"/>	14	J MED LIBR ASSOC	1536-5050	388	1.392	1.368	0.548	62	2.9
<input checked="" type="checkbox"/>	15	J DOC	0022-0418	714	1.309	1.392	0.316	19	9.7
<input checked="" type="checkbox"/>	16	J INF SCI	0165-5515	448	1.080	1.018	0.146	48	5.8
<input checked="" type="checkbox"/>	17	INFORM RES	1368-1613	291	1.027	1.309	0.100	40	3.8
<input checked="" type="checkbox"/>	18	PORTAL-LIBR ACAD	1531-2542	159	0.885	0.873	0.000	25	3.9
<input checked="" type="checkbox"/>	19	LIBR INFORM SCI RES	0740-8188	367	0.870	1.239	0.080	25	7.0
<input checked="" type="checkbox"/>	20	COLL RES LIBR	0010-0870	474	0.820	1.067	0.031	32	8.7

Five-year impact factor

607

Figure 1. Top 20 Information and Library Science journals ranked by JIF-2 score – excerpt from the redesigned summary list to accommodate the new indicators

journals, as the excerpt from my table shows in Table I. The increase in the JIF-5 scores is no surprise (although there are exceptions) as the papers can accrue more citations in a five-year than in a two-year window. Displaying the rank position of all or selected variables can be useful, as rank positions are the key criteria for getting an at-a-glance impression of the rank changes between the JIF-2 and JIF-5 lists for a set of journals. The difference between the JIF scores are very small in the mid-range of the lists in every subject area (that is the reason for using three decimals in *JCR*), and it may not be easy to grasp the difference at a glance.

Actually, sorting the list by rank position change may serve this purpose even better. Similarly, calculating the growth rate in JIF-5 and sorting the list by this criterion may be more revealing. In either case small changes in rank position in either direction are not that critical because of the narrow range of the JIF-2 and JIF-5 scores.

Abbreviated journal title	TC value	TC rank	JIF-2 value	JIF-2 rank	JIF-5 value	JIF-5 rank	Rank change
MIS QUART	4,329	1	5.826	1	9.257	1	0
INFORM SYST RES	2,146	4	2.682	3	6.579	2	1
J AM MED INFORM ASSN	2,394	3	3.094	2	3.489	3	-1
J MANAGE INFORM SYST	1,861	5	1.867	5	3.229	4	1
ANNU REV INFORM SCI	378	17	1.963	4	2.810	5	-1
INFORM MANAGE-AMSTER	1,833	6	1.631	8	2.756	6	2
INFORM SYST J	380	16	1.531	10	2.085	7	3
INT J GEOGR INF SCI	1,410	9	1.822	7	2.068	8	-1
J INF TECHNOL	477	12	1.605	9	2.045	9	0
J HEALTH COMMUN	709	22	1.836	6	2.021	10	-4
J AM SOC INF SCI TEC	3,026	2	1.436	13	1.840	11	2
INFORM PROCESS MANAG	1,441	8	1.500	11	1.639	12	-1
SCIENTOMETRICS	1,515	7	1.472	12	1.538	13	-1
J DOC	714	10	1.309	15	1.392	14	1
J MED LIBR ASSOC	388	15	1.392	14	1.368	15	-1
INFORM RES	291	25	1.027	17	1.309	16	1
INFORM SOC	377	18	0.719	24	1.287	17	7
LIBR INFORM SCI RES	357	20	0.870	19	1.239	18	1
COLL RES LIBR	474	13	0.820	20	1.067	19	1
J INF SCI	448	14	1.080	16	1.018	20	-4

Table I.
List of top 20 Information and Library Science journals by JIF-5 score, showing the rank position change

In the case of categories of much larger sets, such as Biochemistry or Neurosciences, the changes in rank positions are more significant. Such large categories also would require a considerable increase in the number of journals displayed per screen from the current 20 journals to at least 100, in order to scroll up and down the list when making a comparison.

There can be quite remarkable and surprising changes in the rankings by JIF-2 versus JIF-5 scores for a variety of reasons. Even with the availability of a short-term and medium-term JIF score, one should not be trigger-happy in making renewal and subscription decisions without further considerations. For example, *Learned Publishing's* JIF-5 rank position moved down 12 positions from rank No. 23 to rank No. 35, while the position (No. 46) of its competitor, *the Journal of Scholarly Publishing*, did not change (see Table II).

One should also look at the TC value and rank (i.e. the number of total citations received by the two journals in 2007), and consider their JIF-2 and JIF-5 values, where *Learned Publishing* is still much ahead (0.738 versus 0.270 for JIF-2 and 0.563 versus 0.224 for JIF-5). The excellent snapshot provided by the citation report within WoS (not to be confused with the *JCR*) for a search about the journals also confirms the better or much better standing of *Learned Publishing* on a 15-year time span from 1994 to 2008 in terms of the h-index, the average citations per paper, the average citations per year and the total number of citations received (see Figures 2 and 3).

A closer analysis of the data, along with consulting other sources (including peer opinions and price lists), will help in making informed decisions in such cases.

Abbreviated journal title	TC value	TC rank	JIF-2 value	JIF-2 rank	JIF-5 value	JIF-5 rank	Rank change
RES EVALUT	111	39	0.413	33	0.580	33	0
LIBR RESOUR TECH SER	113	38	0.628	26	0.573	34	-8
LEARN PUBL	129	37	0.738	23	0.563	35	12
KNO76WL ORGAN	76	46	0.280	43	0.544	36	7
SOC SCI INFORM	251	30	0.523	31	0.522	37	-6
ASLIB PROV	166	34	0.413	33	0.483	38	-5
INFORM TECHNOL LIBR	80	44	0.326	39	0.390	39	0
INTERLEND DOC SUPPLY	83	43	0.533	30	0.318	40	-10
REF USER SERV Q	88	42	0.175	50	0.293	41	9
ELECTRON LIBR	95	41	0.228	48	0.279	42	6
ONLINE	77	45	0.368	37	0.271	43	-6
LIBR INFORM SC	10	51	0.273	45	0.261	44	1
PROGRAM-ELECTRON LIB	168	33	0.111	51	0.226	45	6
J SCHOLARLY PUBL	30	50	0.270	46	0.224	46	0
LIBRI	57	47	0.286	42	0.218	47	-5
LIBR J	369	19	0.295	41	0.216	48	-7
LIBR COLLECT ACQUIS	45	49	0.250	47	0.211	49	-2
SCIENTIST	283	26	0.322	40	0.170	50	-10
ECONTENT	47	48	0.196	49	0.111	51	-2

Five-year impact factor

609

Table II.
Surprising downward move in the rank position of *Learned Publishing*

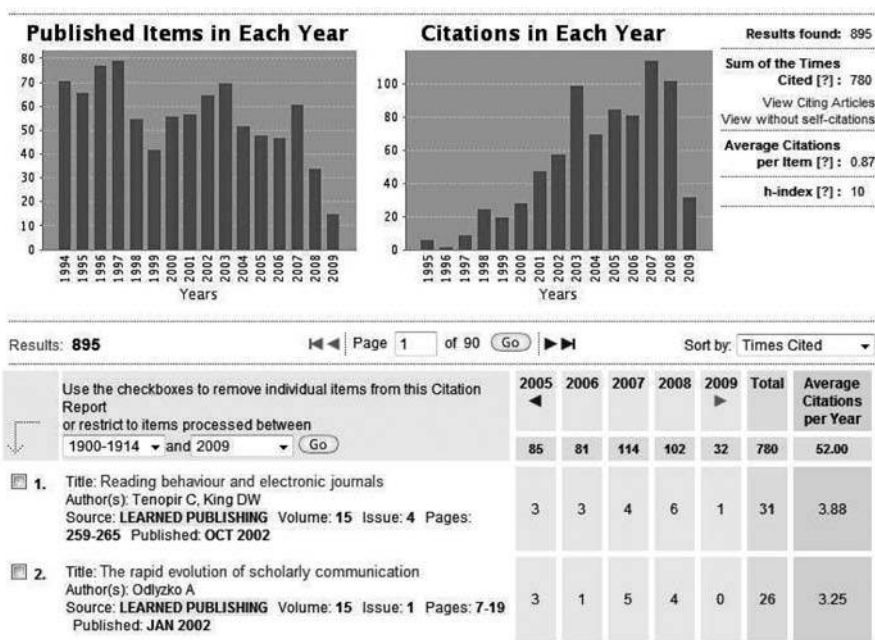


Figure 2.
Snapshot from the citation report for *Learned Publishing* in Web of Science

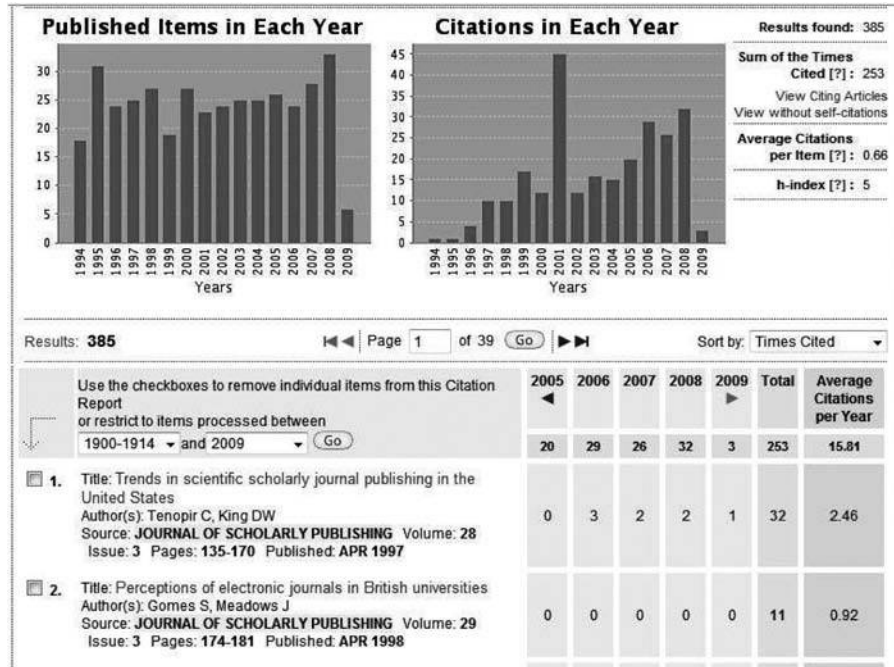


Figure 3. Snapshot from the citation report for *Journal of Scholarly Publishing* in Web of Science

The overall picture

In the revised 2007 web edition of the *JCR*, there is information about 6,426 journals and other serial publications in the Science section, and 1,866 in the Social Sciences section. (For Arts and Humanities there has never been a *JCR* as a large proportion of the citing reference sources are books rather than journals). The total number of unique titles is 7,961 (not 8,292) because there are 331 journals that appear in both sections of *JCR*. This in turn is the consequence of the fact that some journals are assigned to more than one subject category, for example, some of the journals in the Information and Library Science category within the Social Sciences section are also assigned to the subcategory of Computer Science – Information Systems in the Science section. On average, journals are assigned to 1.6 subject categories.

The total number of citations accrued in 2007 by the 7,961 unique journals was slightly above 27.5 million. However, not all the indicators are available for all these journals. For example, the JIF-5 score is not available for 645 journals and the JIF-2 score is unavailable for 56 journals. This may look odd but there are good reasons for this. Several journals had not been published for all the years in the 2002 to 2007 period, or were published under another title, or were not covered by Thomson-Reuters for the entire six-year time span. Others have merged into another journal, such as *Animal Science* and *Animal Research* into *Animal*. Recent title changes or mergers are the cause of most of the missing JIF-2 scores. This is the case for *Developmental Neurobiology*, which became *Journal of Neurobiology*.

There are still 7,279 unique journals in the 2007 edition of *JCR* that have both JIF-2 and JIF-5 scores, and their analysis can reveal very important changes in the landscape at various levels of disaggregation – at the journal, disciplinary category and subcategory levels. Because of the very high variance in the productivity and citedness measures across the Science and Social Sciences sections of the *JCR*, and even between the disciplinary categories and subcategories, the global aggregates for each variable for all the unique journals are not much use to report. I make one exception, however, for the distribution of the nearly 27.1 million citations received in 2007 by the 7,279 unique journals that have both JIF-2 and JIF-5 scores. Overall, the mean of the distribution for this set was 1.7 per cent for 2007 papers, 16.2 per cent for 2005 to 2006 papers, and 40.6 per cent for 2002 to 2006 papers. The median values were 1.1 per cent, 13.9 per cent and 39.5 per cent, respectively. Although the calculations need further corroboration, this is an important indicator for appreciating the importance of the inclusion of the new five-year impact factor in *JCR*.

Conclusion

The five-year mid-term JIF complements very well the short-term two-year JIF for indicating the prestige, reputation and influence of the journals through the prism of the average productivity of journals and the citedness counts of articles published in the journals for a longer time span. As mentioned above, breaking down the various indicators by disciplinary and subdisciplinary categories, or even by the language and the country of publication of the journals (not the country affiliation of the authors) can provide further insight into the landscape of scholarly publishing.

It may be feasible that some of the other proposals presented by the best scientometricians for improving the JIF and its alternatives will be implemented in various specialty editions of *JCR*. Particularly interesting would be the adding of scores computed through diachronous instead of or in addition to synchronous measurement (Rousseau *et al.*, 2001; Moed *et al.*, 1999; Christensen and Ingwersen, 1996; Wormell, 1998), creating new indicators based on the level of uncitedness of articles in journals (Weale *et al.*, 2004), and calculating percentile JIF, JIF point averages (Rousseau, 2005; Sombatsompop *et al.*, 2005) and/or JIFs based on article count (Markpin *et al.*, 2008), with or without self-citations. The easiest would be calculating JIF scores using even longer time spans (Moed *et al.*, 1985; Rowlands, 2002). In a digital world (as opposed to the print world), offering database variants from the same master file using various subsets and algorithms is feasible. This would allow users to choose the edition that best fits their needs. In spite of some limitations, the enhancements in *JCR* is an important step, especially with the possibility of instantly looking up details at the article level in WoS for those who subscribe to it. It would require a hot link from *JCR* to WoS, just as there is a very efficient link from WoS to *JCR* to look up the indicators of the journal.

I am sure that the best and most constructively critical scientometricians mentioned above will keep proving the importance of scientometrics for measuring, assessing and improving research, despite the recent paper in *Current Science* (Balaram, 2008), which certainly will raise the JIF of the journal through many references, even though the gain will be somewhat unfair for two reasons. One is that some of the references will be certainly negative ones (which are not and cannot be feasibly distinguished in the citation indexing process. Neither would it worth the effort for the relative rarity of the

negative, dismissive references). The other reason is much more important and relevant. Balam's paper was an editorial that is not counted in the denominator of citable documents – which may remain an evergreen issue for many of us.

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