

Correlation between Journal Self-citation and Impact Factor in ISC's PJCR Agriculture and Veterinary Science Journals during 2001-2007

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Abstract

This study investigates correlation between journal self – citation and impact factor in Agriculture and Veterinary subject category through the scientific journals indexed in ISC's PJCR during 2001 to 2007. Citation analysis is used to conduct the research. The results indicate a significant correlation between impact factor and journal self – citation ($r=0.425$, $\text{sig}= 0.000$); that is, journals with low impact factor have less self – citation that indicates self – citation has a positive effect on impact factor. Pearson Correlation Coefficient demonstrates a relationship between impact factor and number of articles in negative side ($r=-0.170$, $\text{sig}=0.037$) that means the number of articles does not affect journal impact factor and also journals with more articles do not have higher impact factor. There is a significant relationship between the number of articles and journal self – citation ($r= 0.596$, $\text{sig} = 0.000$) that indicates the more number of articles the more number of self-citations. Findings show that journal self – cited rate in Agriculture and Veterinary subject category during 2001 to 2007 has undergone a descending process. After the removal of journal self – citation, the rank of 47 journals descended, 86 journals ascended, the rank of 18 journals did not change and the impact factor of 28 journals decreased to zero.

Keywords: Self-citation, Impact Factor, Persian Journal Citation Reports (PJCR), Islamic World Science Citation Center (ISC).

Introduction

A scientific paper does not stand alone; it is embedded in the literature of the subject (Ziman, 1968). The nature of this embedding is specified by the use of footnotes and/or

reference lists. The fact that a document is mentioned in a reference list indicates that in the author's mind there is a relationship between a part or the whole of the cited document and a part or the whole of the citing document. Citation analysis is that area of Informetrics, which deals with the study of these relationships (Egghe & Rousseau, 1990).

According to Zunde (1971), there are three main application areas in citation analysis:

- 1) qualitative and quantitative evaluation of scientists, publications and scientific institutions;
- 2) modeling of the historical development of science and technology;
- 3) information search and retrieval.

It is a fact that a portion of total citations to a journal includes self-citation (McVigh, 2004). The term 'self-citation' has been used with different meanings. If the citing paper has one or more authors in common with the cited paper, one usually describes this feature as self-citation. However, references to articles published in the same journal in which the citing article appears are also said to be self-citations. Citations of articles authored by people working in the same scientific institution or in the same research group as the citing authors are also called 'self-citations'. We concentrate on journal self-citation in this paper. The self-cited rate relates a journal's self-citations to the number of times it is cited by all journals including itself (Egghe & Rousseau, 1990).

Quantitative assessment of the scientific merit of journals is being used increasingly. The idea of an 'impact' was first mentioned by Garfield (1955) as a reference counting in 1955. The term "impact factor", the measure used to rank the importance of scientific journals, was coined with the publication in 1963 of the Science Citation Index for 1961. The citation rate of a journal which is quantified as its impact factor has been a subject of controversy. The impact factor has become the common currency of 'scientific quality' (Neuberger & Counsell, 2002).

It is obvious that a journal's impact factor has a close relationship with its self-cited rate and the number of self-citations to articles of the journal is important to the calculation result of its impact factor. It has been observed by some researchers (Fassoulaki et. al., 2000; Sevinc, 2004) that self-citations of a journal may affect its impact factor and a high self-citing rate of a journal may positively affect its impact factor.

Impact factor can be affected by many factors such as the journal self-cited rate (Fassoulaki et. al., 2000; Motamed et al., 2002). If this factor were changed naturally or artificially, the impact factor would also change. Therefore, changing the number of self-citations becomes an instrument in the hands of the editors who attempt to raise journal impact factors. Dong, Loh & Mondry (2005) pointed out one quite crude way of active manipulation of IF by an author requesting to increase references to the papers published in his journal, and consequently editors may artificially raise a journal's IF. The first manipulation announcement came by Smith in 1997, who pointed it out in a News of BMJ

that the journal *Leukemia* had been accused of trying to manipulate its impact factor by authors who had submitted a paper to *Leukemia* asking them to increase the number of references to papers published in *Leukemia*. Neuberger & Counsell (2002) reported another similar case: they described how one journal editor suggested the inclusion of more references to that journal. Hemmingsson et. al. (2002) pointed in the letter to editor-in-chief of *AJR* that editors of some journals were sending copies of articles previously published in their journals together with the review copy of another article to the referees and were asking them whether it was possible to include those published articles in the reference list. Sevinc (2004) reported that the influence of authors' choice of references distorts the perception of the journal within the scholarly community and is considered as highly unethical behavior.

The Journal Citation Reports (JCR) and Science Citation Index (SCI) are powerful and authoritative bibliometric tools produced by the Institute for Scientific Information (ISI) (now Thomson Scientific). ISI provides several indicators for measuring intellectual development from international perspective just for publications in English language. Accordingly, the scientific journals in different countries have less chance to be evaluated based on bibliometric indicators. For this reason, Regional Information Center for Science and Technology (RICeST) started to construct the Persian Science Citation Index (PSCI) and Persian Journal Citation Reports (PJCR) as products of ISC in 2000, and has been releasing the service from 2004 (Ghane, 2010).

This study attempts to investigate correlation between journal self-citation and impact factor in Agriculture and Veterinary subject category through the scientific journals indexed in ISC's PJCR during 2001 to 2007.

Review of Literature

Snyder and Bonzi (1998) examined patterns of self-citation in six disciplines distributed equally among the Physical and Social Sciences and the Humanities. Sample articles were examined to determine the relative numbers and ages of self-citations and citations to others in the bibliographies and to the exposure given to each type of citation in the text of the articles. Significant differences in the number and age of citations were found between disciplines. Generally, 9% of all citations were self-citations; 15% of Physical Science citations were self-citations, as opposed to 6% in the Social Sciences and 3% in the Humanities. Within disciplines, there was not significantly different amount of coverage between self-citations and citations to others. Fassoulaki, et. al. (2000) investigated self-citations in the 1995 and 1996 issues of six Anesthesia journals by calculating the self-citing and self-cited rates for each journal. Findings showed that the self-citing and self-cited rate ranged from 57% to 4% and 35% to 17%, respectively. The study showed a significant influence of self-citations on six journals' impact factor in Anesthesia. Aksnes

(2003) investigated the role of self-citation in the scientific production of Norway (1981-1996). More than 45,000 publications were analyzed. Using a three-year citation window, he found that 36% of all citations represent author self-citations. There is a strong positive correlation between the number of self-citations and the number of authors of the publications. Also, the share of self-citation shows significant variations among different scientific disciplines. The results are relevant for the discussion concerning the use of citation indicators in research assessments. McVeigh (2004) found that self-citation rate shows only a weak correlation with the impact and subject of a journal. There is also a weak correlation between self-citation rate and the size or specificity of the category (categories) assigned to a journal self-citation of 87 most productive semiconductor journals with regard to self – citing rate and self – cited rate studied by Tsay (2006). The results showed that older journals have more tendency toward self- citing than self- cited. Journals with high self-citing rate are more productive and receive more citations. Biglu (2007) in his paper investigated the trends of impact factors and self-citation rates of journals indexed in the JCR by two neighboring countries of Iran and Turkey for a period of five years (2000- 2005). The study showed that the share of Turkish journals entering data to the JCR data bank was two times higher than that of Iranian journals. The self-citation tendency among Iranian journals has increased dramatically throughout the period of study; it raised from 8% self-citation rate in 2000 to 18% in 2005, an increase of 2.25 times. The self-citation rate by Turkish journals showed a negative trend; its self-citation rate fell from 22% in 2002 to 15% in 2005. The impact factors of Turkish journals showed faster growth than the Iranian journals. The mean value of impact factor for Turkish journals in 2000 was 0.49 lower than the mean value of impact factor for Iranian journals, but in 2005 the mean value of impact factor for Turkish journals stayed 0.14 higher than the mean value of impact factor for Iranian journals. Frandsen (2007) studied 32 economics journals indexed in Social Science Citation Index. The results showed that there was a positive correlation between self-citing rate and JIF, contrary to self-cited rate. Shahryari & Afghahi (2008) investigated the status of self-citation and its comparison in the articles of two journals of *Oloume Etela' Resani (Information Sciences)* and *Faslname-ye Ketab (Book Quarterly)* during 1995 to 2004. The study analyzes indexes and criteria such as the number of self-citations, the ratio of self-citation, the ratio of articles with self-citations, self-citing authors, and the relationship between journals and self-citation, academic rank of self-citing authors, types of cited documents, and self-citation lives. Results of the study revealed that not only the self-citation ratio was very low in both journals, but also there was not a significant difference in both journals. Also, there was not correlation between “journal” and the “ratio of self-citing”; however, there existed relationships between journal and academic rank, type of the cited document, and self-citation lives. Ghane (2009) studied both author and journal self – citation in Medical Sciences using ISC's PJCR.

Findings showed that there was positive correlation between journal self – citation and impact factor. Also, journals with low impact factor had lower self – cited rate. The study also showed that there was not correlation between impact factor and adjusted impact factor with the number of journal articles. Tabatabaie (2009) in his M. A. thesis investigated Iranian scholars' self-citation status in the Web of Science in 2003. His findings show that Iranian scholars in the field of Chemistry with 56.8% diachronous self-citations have had the most citations to previous works and researchers in Agriculture field with 21.7% diachronous self-citations have had the least citation to their previous works. The total self-citation of Iranian scholars in the Web of Science in 2003 was about 40% and the difference between fields was an important factor in the amount and percent of Iranian scholars' self-citation. Ghane (2010) investigated self-citation in PJCR's Engineering journals during 2002 to 2006. Findings showed that within the five years mean rates for journal self-citation and author self-citation were 41% and 66%, respectively. Findings also reported that the correlation between journal self-citation and impact factor was significant ($r=0.300$, $sig=0.032$). Moreover, after self-citation removal, the maximum rankings changed. There was also not correlation between journal impact factor and the number of articles ($r= -0.031$, $sig=0.831$). Jowkar & Goltaji (2010) compared self-citation rate of published articles in two Iranian journals, *Faslname-ye Ketab* and *Faslname-ye Ketabdary va Etela' rasany* which are indexed in PJCR's ISC during 2003 to 2007. Some indexes such as the number of author self –citation, percentage of author self-citation, number of articles with author self-citation, also type of self-cited document in each journal, self- citation life, the ratio of journal self-citation , journals impact factor before and after omitting self-citation and the functionality of journals after omitting self-citations were calculated and analyzed. The results indicated that self-citation ratio in both journals was rather low. On the whole, *Faslname-ye Ketabdary va Etela'rasany* has got more self-citations than *Faslname-ye Ketab*, though the ratio of self –citations in the latter was far more than the former in 2006; however, it was vice versa in 2007. Also, this survey showed that impact factor resulted in the change of journal rank after omitting self –citation.

Mehrad & Goltaji (2010) investigated self-citation in PJCR's Humanities journals during 2001to 2007. The results indicate a significant correlation between impact factor and journal self – citation ($r=0.606$, $sig= 0.000$) that means journals with low impact factor have less self – citation, which indicates self – citation has a positive effect on impact factor. Pearson Correlation Coefficient demonstrates a relationship between impact factor and number of articles in negative side ($r=-0.163$, $sig=0.002$) that means the number of articles does not affect journal impact factor and also journals with more articles do not have higher impact factor. There is a significant relationship between the number of articles and journal self – citation ($r= 0.427$, $sig = 0.000$) that indicates the more number of articles the more number of self-citations. Findings show that journal self – citation rate in Humanities

subject category during 2001 to 2007 has been a descending process. After removal of journal self – citation, the rank of 108 journals descended, 240 journals ascended and the rank of 23 journals did not accept any change.

Research Objectives

The aim of this study is to survey journal self- citation in Agriculture and Veterinary science journals and recalculate journal impact factors in this subject category and find the correlation between journal self- citation and impact factor in those journals. The following research questions were used to inform the study:

1. Is there a correlation between impact factor and journal self – citation?
2. Is there a correlation between impact factor and number of articles?
3. Is there a correlation between journal self- citation and number of articles?
4. Did self- cited rates change within the years in question?
5. Did the performance of journals after omitting journal self – citation toward impact factor change?

Methodology and Procedure

Citation analysis has been used to conduct this research. The population of this study includes 151 ISC's PJCR Agriculture and Veterinary journals with impact factor during 2001to 2007. To do this, data from the 2001-2007 PJCR was extracted (journals with impact factor). Using ISC's PJCR and choosing the year and the field of Agriculture and Veterinary sciences, the journals with impact factor were shown, and also using citing journals option, the list of citing journals to the specific journal was displayed. Then, using the list of number of self- citation and effective self- citations on impact factor and SPSS software version 16 (Pearson Correlation Test), data were analyzed. Since a proportion of citations includes self- citations, journals' impact factor was recalculated which is known as Adjusted Impact Factor (AIF). To do this, the following equation is used. Suppose we want to calculate a journal's AIF for

2006:

$$\text{AIF} = \frac{[(A-a)+(B-b)]}{E=(C+d)}$$

Where:

A= Citations in a given year (suppose 2006) to articles published in 1 previous year (2005)

a = Self-citations in a given year (suppose 2006) to articles published in 1 previous year (2005)

B= Citations in a given year (suppose 2006) to articles published in 2 previous years (2004)

b = Self-citations in a given year (suppose 2006) to articles published in 2 previous years (2004)

C= Number of Articles (2005)

D= Number of Articles (2004)

E= Total number of journal articles (2005+2004)

(Ghane, 2010)

Results

Question 1: Is there a correlation between impact factor and journal self – citation?

In general, there is a significant correlation between journal self-citation and impact factor ($r=0.425$, $sig= 0.000$) that means journals with high impact factor have more self – citations. More investigations show that this correlation has been more powerful in 2006, 2002 and 2007, but not so in 2001, 2003, 2004 and 2005. See Table 1.

Table 1

Correlation between Journal Self-citation and Impact Factor in Agriculture and Veterinary Journals

Year	Pearson	Sig	number
2001	0.125	0.684	13
2002	0.618	0.005	19
2003	0.330	0.144	21
2004	0.239	0.283	22
2005	0.409	0.059	22
2006	0.697	0.000	29
2007	0.475	0.016	25
2001-2007	0.425	0.000	151

In Figure 1 correlation between journals self – citation and impact factor in Agriculture and Veterinary journals is shown.

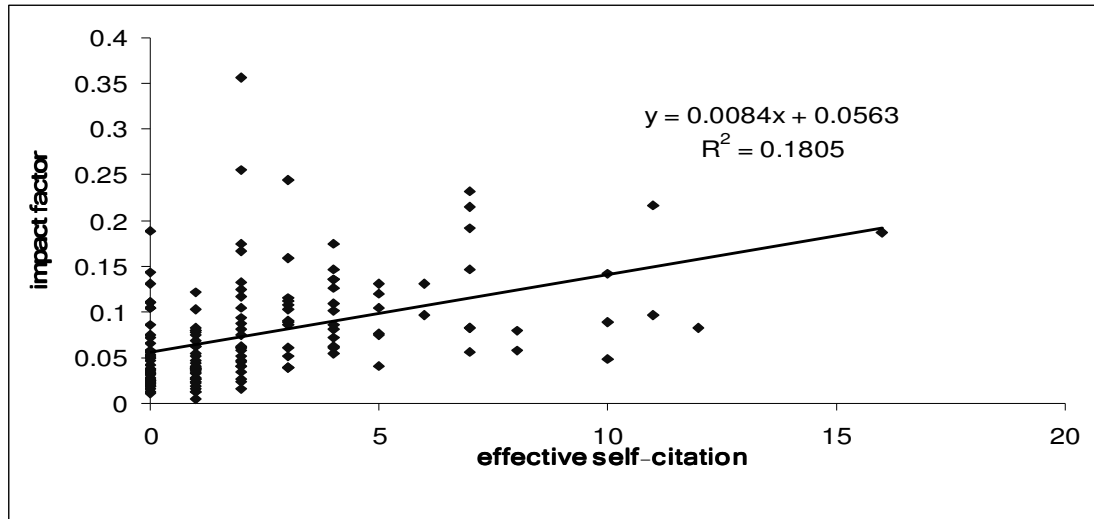


Figure 1. Correlation between journal self-citation and impact factor in Agriculture and Veterinary journals

If we want to investigate self-citation share, we can say that 18 percent of changes in impact factor are under the influence of journal self-citation. Journals with low impact factor have fewer self-citations and the number of self-citation among journals with high impact factor is higher. It is common to find some journal self-citations among all citations of journal and since the citations have an effective role in calculating impact factor, the increase in the number of journal self-citation increases the number of citations and accordingly journal's impact factor increases. This finding is in line with Ghane (2009 and 2010), Fassoulaki & et.al. (2000), Jowkar & Goltaji (2010), Mehrad & Goltaji (2010), but in contrast with Tsay (2006), McVeigh (2004), and Frandsen (2007).

Question 2: Is there a correlation between impact factor and number of articles?

Pearson Correlation Coefficient demonstrates a relationship between impact factor and number of articles in negative side ($r=-0.170$, $\text{sig}=0.037$) that means the number of articles does not affect journal's impact factor and journals with more articles do not have higher impact factor. Also, this relationship is not significant in each year, separately. This finding confirms Ghane (2009 and 2010), Mehrad & Goltaji (2010) and McVeigh (2004).

A distinct weakness of the IF's algorithm lies in the inclusion of articles into the numerator count that are considered as "non-citable" in the denominator count. Citations to "non-citable" items may dramatically increase a journal's IF. Journals publishing large proportion of "non-citable items" can thus achieve higher IFs than journals that predominantly publish "citable" items. Similarly, the ISI algorithm does not take into account a journals' respective composition of research articles, technical notes and reviews. Reviews are more likely to be cited than original research papers. Journals publishing a high proportion of review papers consequently attract more citations and thus are likely to achieve a higher IF (Dong, Loh & Mondry, 2005).

In Table 2 and Figure 2, correlation between journals' self – citation and number of articles in Agriculture and Veterinary journals are shown.

Table 2

Correlation between Journal Self-citation and Number of Articles in Agriculture and Veterinary Journals

Year	Pearson	Sig	number
2001	- 0.196	0.520	13
2002	0.006	0.981	19
2003	0.193-	0.401	21
2004	0.160-	0.477	22
2005	0.006	0.980	22
2006	0.123-	0.527	29
2007	0.354-	0.083	25
2001-2007	0.170-	0.037	151

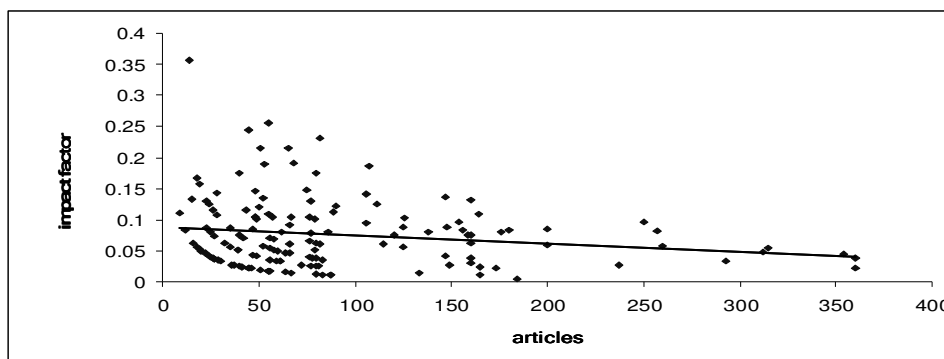


Figure 2. Correlation between impact factor and number of articles in Agriculture and Veterinary journals

Question 3: Is there a correlation between journal self- citation and number of articles?

Citation may be used for obtaining evidence or collecting witnesses from previous texts. Journal articles are one of the citations' sources. If in a subject area or its subfields, the number of journals is few, authors have few opportunities for publishing articles and accordingly have few chances for citing. If someone in the field is making theories or wants to continue his/her own previous work, self-citation and journal self-citation will occur. The answer to Question 3 is presented in Table 3 and Figure 3.

Table 3

Correlation between Journal Self-citation and Number of Articles in Agriculture and Veterinary Journals

Year	Pearson	Sig	number
2001	0.811	0.001	13
2002	0.756	0.000	19
2003	0.754	0.000	21
2004	0.681	0.000	22
2005	0.714	0.000	22
2006	0.762	0.000	29
2007	0.117	0.578	25
2001-2007	0.596	0.000	151

As Table 3 shows correlation between journal self-citation and number of articles is significant in all investigated years except 2007. This result is in contrast with Tsay (2006).

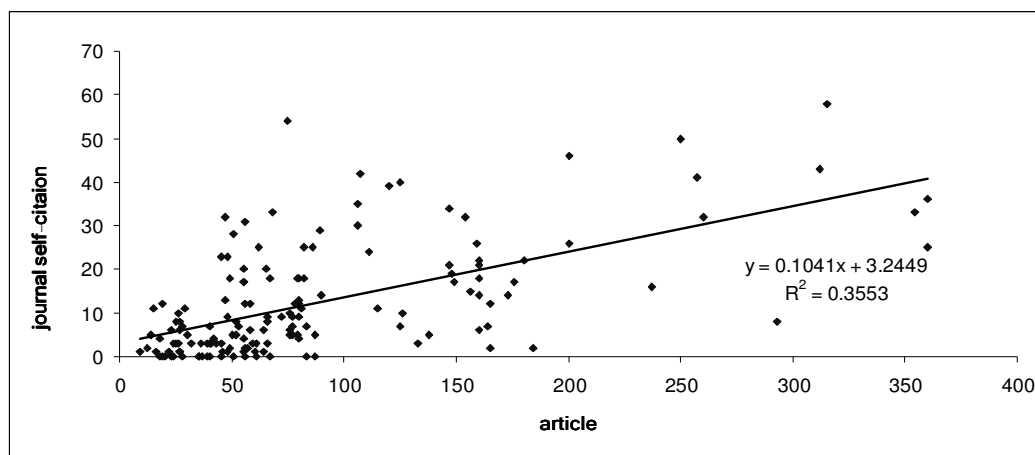


Figure 3. Correlation between journal self-citation and number of articles in Agriculture and Veterinary journals

Question 4: Did self-cited rates change within the years in question?

Table 4 and Figure 4 show the self-cited rate during 2001 to 2007 in Agriculture and Veterinary science journals. With the following formula we calculated self-cited rate during the investigated years, which manifested a descending trend.

$$\text{The self cited rate} = \frac{\text{number of self - citations}}{\text{total cites}} \times 100$$

Table 4

Self-cited Rate in Agriculture and Veterinary Journals during 2001-2007

Year	Self – cited rate
2001	31.54
2002	34.12
2003	33.99
2004	27.82
2005	30.55
2006	27.44
2007	30.46

According to the formula cited above, the mean for journal self-cited rate during 2001 to 2007 is: $\frac{1881}{6258} \times 100 = 30.05$

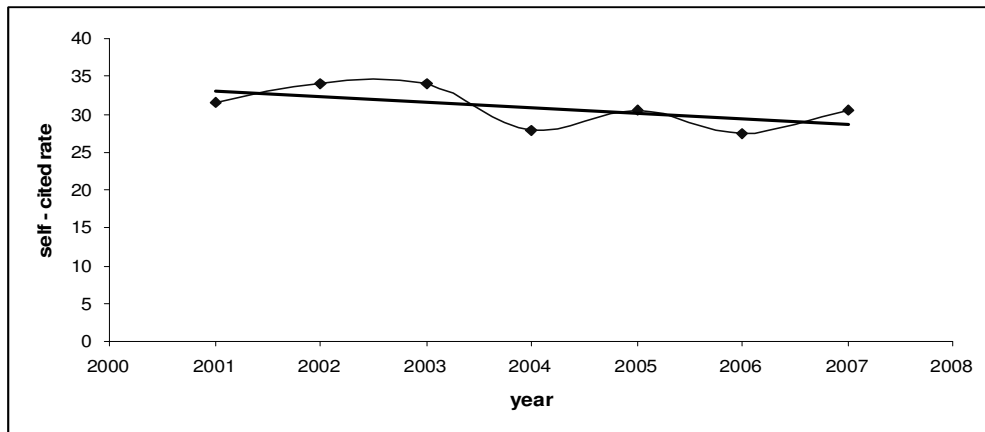


Figure 4. Self-cited rate in Agriculture and Veterinary journals during 2001-2007

5. Did the performance of journals after omitting journal self – citation toward impact factor change?

To answer this question, after removal of effective journal self –citation, we calculated impact factor and then ranked the journals according to their adjusted impact factor. Of 151 journals, after the removal of journal self-citation, 47 journals’ rank descended, 86 journals’ rank ascended, the rank of 18 journals did not change and the impact factor of 28 journals decreased to zero.

Conclusion

Although self-citation is acceptable to some extent (at the most 20%) according to an investigation of ISI journals (McVeigh, 2004), its effect on journal impact factor is inevitable. Impact factor is affected by journal self-citation ($r=0.425$, $sig= 0.000$) that means journals with high impact factor have more journal self-citation. The findings show

that the number of articles does not affect journal impact factor ($r=-0.170$, $\text{sig}=0.037$) and there is a significant relationship between the number of articles and journal self – citation ($r= 0.596$, $\text{sig} = 0.000$). In this study, the mean rate of journal self-cited is 30.05 percent and journal self – cited rate in Agriculture and Veterinary subject category during 2001 to 2007 has witnessed a descending process. After the removal of journal self – citation, the rank of 47 journals descended, 86 journals ascended, the rank of 18 journals did not change and the impact factor of 28 journals decreased to zero.

References

- Aksnes, D. W. (2003). A macro study of self –citation. *Scientometrics*, 56 (2), 235-246.
- Biglu, M. H. (2007). Tendency towards the self-citation among journals in Iran and Turkey. *Bilgi Dünyası*, 8 (2), 297-309.
- Dong, P., Loh, M. & Mondry, A. (2005). The impact factor revisited. *Biomedical Digital Libraries*, 2, 7.
- Egghe, L., & Rousseau, R. (1990). *Introduction to informetrics quantitative methods in library, documentation and information science*. Amsterdam: Elsevier Science Publishers.
- Fassoulaki, A., & et. al. (2000). Self – citation in six anesthesia journals and their significance in determining the impact factor. *British Journal of Anesthesia*, 84 (2), 266-269.
- Frandsen, T. F. (2007). Journal self-citation-analyzing the JIF mechanism. *Journal of Informetrics*, 1, 47-58.
- Garfield, E. (1995). Citation indexes to science: A new dimension in documentation through association of ideas. *Science*, 122(108–11).
- Ghane, M. R. (2009). Correlation between self-citation and impact factor in Persian journal citation reports' medical journals. *Health Information Management*, 6 (1), 53-64.
- Ghane, M. R. (2010). Self- Citation in PJCR's Engineering journals and their significance in determining impact factor during 2002-2006. *IJISM*, 8(1), 21-37.
- Hemmingsson, A., & et. al. (2002). Manipulation of impact factors by editors of scientific journals. *American Journal of Roentgenology*, 178 (3), 767.
- Jowkar, A. & Goltaji, M. (2010). Comparative study of self-citation rate in two journals, Faslname-ye Ketab and Faslname-ye Ketabdary va Etela' rasany based on PJCR during 1382-1386. *Library and information Sciences*, 13 (1), 91-110.
- McVeigh, M. E. (2004). Journal self-citation in the journal citation reports® – science edition (2002): A citation study from the Thomson corporation. Retrieved Oct 25, 2008, from www.thomsonscientific.com/media/presentrep/essayspdf/selfcitationsinjr.pdf
- Mehrad, J. & Goltaji, M. (2010). Correlation between journal self-citation with impact

- factor for the scientific publications in humanities published between 2001 and 2007 based on Persian journal citation report generated by Islamic Science Citation database. *Information Sciences & Technology*, 25 (2), 189-206.
- Motamed, M., & et. al. (2002). Title self - citations and impact factors in otolaryngology journals. *Clinical Otolaryngology*, 27 (5), 318–320.
- Neuberger, J. & Counsell, C. (2002). Impact factors: Uses and abuses. *Eur J Gastroenterol Hepatol*, 14, 209–11.
- Sevinc, A. (2004). Manipulating impact factor: An unethical issue or an editor's choice? *Swiss Medical Weekly*, 134, 410.
- Shahryari, P., Afghahi, E. (2008). Self-citation in journals of ettela rasani: Information science quarterly and faslname-ye ketab during 1374-1383(1995 – 2004). *Faslname-ye Ketab*, 72, 125-136.
- Snyder, H., & Bonzi, S. (1998). Patterns of self-citation across disciplines (1980-1989). *Journal of Information Science*, 24 (6), 431-435.
- Tabatabaei, Y. (2009). *Author self-citation analysis of the ISI indexed articles published by Iranian researchers in 2003*. M.A. Thesis. Tehran: University of Tehran.
- Tsay, M. Y. (2006). Journal self-citation study for semiconductor literature: Synchronous and diachronous approach. *Information Processing and management*, 42 (6), 1567-1577.
- Ziman, J. M. (1968). *Public knowledge: an essay concerning social dimension of science*. Cambridge: Cambridge University Press.
- Zunde, P. (1971). Structural models of complex information sources. *Information Storage and Retrieval*, 7, 1-18.

