Article Influence Score = 5YIF divided by 2

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Abstract

This paper examines the novelty and usefulness of two new journal performance metrics, namely the Eigenfactor Score and Article Influence Score, using ISI data for 2009 for the 200 most highly cited journals in each of the sciences and social sciences, and compares them with existing ISI metrics, namely Total Citations and the 5-year Impact Factor (5YIF) of a journal. It is shown that the sciences and social sciences are different in terms of the strength of the relationship of journal performance metrics, although the actual relationships are very similar.

Keywords: Journal performance metrics, Total citations, 5-year impact factor (5YIF), Eigenfactor score, Article influence score.

JEL Classification: A12.

"They're digging in the wrong place!"
Indiana Jones, in *Raiders of the Lost Ark*

1. Introduction

Evaluating research quality is fundamental to the sciences and social sciences. Research assessment rankings are essential to evaluate the research performance of individuals and the quality of academic journals. The perceived research performance of individual researchers is crucial for hiring, firing, tenure and promotion decisions. In the absence of clear signals regarding the inherent, and frequently latent, quality of research, the perceived quality of a journal is frequently used as a proxy for the quality of a research paper.

The Thomson Reuters ISI Web of Science database (hereafter ISI) is a leading high quality database for generating research assessment measures, especially citations, to evaluate the research performance of individual researchers and the quality of academic journals. This paper examines the novelty and usefulness of two new journal performance metrics, namely the Eigenfactor Score and Article Influence Score, using ISI data for 2009 for the 200 most highly cited journals in each of the sciences and social sciences, and compares them with existing ISI metrics, namely Total Citations and the 5-year Impact Factor (5YIF) of a journal. It is shown that the sciences and social sciences are different in terms of the strength of the relationship of journal performance metrics, although the actual relationships are nevertheless very similar.

2. Research Assessment Measures (RAM)

Leading journal performance measures for an ISI Journal Citations Reports (JCR) calendar year, which is the year before the annual RAM is released, are as follows:

(1) 2-year impact factor (2YIF): The classic 2-year impact factor (2YIF) of an ISI journal is typically referred to as "the impact factor". For a JCR year, the 2YIF of an ISI journal is defined as" Total citations in a JCR year to papers published in an ISI journal in the previous 2 years/Total papers published in an ISI journal in the previous 2 years".

(3) 5-year impact factor (5YIF): For a JCR year, the 5YIF of an ISI journal is defined as "Total citations in a JCR year to papers published in an ISI journal in the previous 5 years/Total papers published in an ISI journal in the previous 5 years."

(5) Eigenfactor score: The Eigenfactor score (Bergstrom (2007), Bergstrom, West and Wiseman (2008)) is a modified 5YIF. For a JCR year, the Eigenfactor algorithm (see www.eigenfactor.org/methods.htm) effectively ranks journals according to citations and the length of time that researchers are logged on to a journal's website. It is, in effect, a journal website citation search.

(6) Article Influence: The Article Influence score measures the relative importance of an ISI journal on a per-article basis, and is a standardized Eigenfactor score. For a JCR year, Article Influence of an ISI journal is defined as "Eigenfactor score divided by the fraction of all ISI articles published by the ISI journal." Article Influence is defined in terms of the relative time that researchers are logged on to a journal's website

Fersht (2009) showed that there was a very strong positive correlation between the Eigenfactor score and Total Citations, with a correlation coefficient of 0.968 for the top 200 most highly cited ISI journals (based on 2YIF) in the sciences using ISI citations data for 2007. In Figures 1-4 we evaluate the 200 most highly cited journals, according to 2YIF, in both the sciences and social sciences for 2009, by relating the Eigenfactor Score to Total Citations and the Article Influence Score to 5YIF. The science (social science) citations data for 2009 were downloaded from ISI on 19 June 2010 (20 June 2010) for all citations.

A linear regression relationship, with the Eigenfactor Score as a function of Total Citations, is given in Figures 1 and 3 for the sciences and social sciences, respectively. The estimated model shows that the Eigenfactor Score increases, on average, by 0.000004 and 0.000003 for each unit increase in Total Citations for 2009 for the sciences and social sciences, respectively. The goodness-of-fit measures, as given by R^2 = 0.931 and R^2 = 0.659 for the sciences and social sciences, respectively, show that the Eigenfactor Score can be estimated accurately, especially for the sciences, on the basis of a linear relationship with Total Citations. The approximate relationships between the Eigenfactor Score and Total Citations for the sciences and social sciences, respectively, may be expressed as:

Eigenfactor Score = 0.0000033(Total Citations) (for sciences);
Eigenfactor Score = 0.000002(Total Citations) (for social sciences).

Another linear regression relationship, with the Article Influence Score as a function of 5YIF, is given in Figures 2 and 4 for 2009 for the sciences and social sciences, respectively. The estimated models show that the Article Influence Score increases, on average, by 0.489 and 0.479 for each unit increase in 5YIF for 2009 for the sciences and social sciences, respectively. The goodness-of-fit measures, as given by R^2 = 0.923 and R^2 = 0.572 for 2009 for the sciences and social sciences, respectively, show that the Article Influence Score can be approximated accurately for both the sciences and social sciences on the basis of a linear relationship with 5YIF, namely:

Article Influence Score = 5YIF/2.

3. Conclusion

Although the sciences and social sciences are dramatically different in terms of the strength of the underlying relationship of the journal performance metrics considered in this paper, the actual relationships are nevertheless very similar. As Article Influence is a modification of 5YIF, it is perhaps not surprising that the two scores are highly and positively correlated. Given the very high correlations between the Eigenfactor Score and Total Citations, and between the Article Influence Score and 5YIF, and the corresponding high goodness-of-fit measures for the linear regression relationships, the Eigenfactor Score and Article Influence Score would not seem to be entirely necessary for the social sciences, and not at all necessary for the sciences.

As the new journal performance measures captured in the Eigenfactor Score and Article Influence Score add little to what is already available in ISI, we concur with Indiana Jones, who remarked about his competitors in search of the Lost Ark of the Covenant: “They’re digging in the wrong place!”

References

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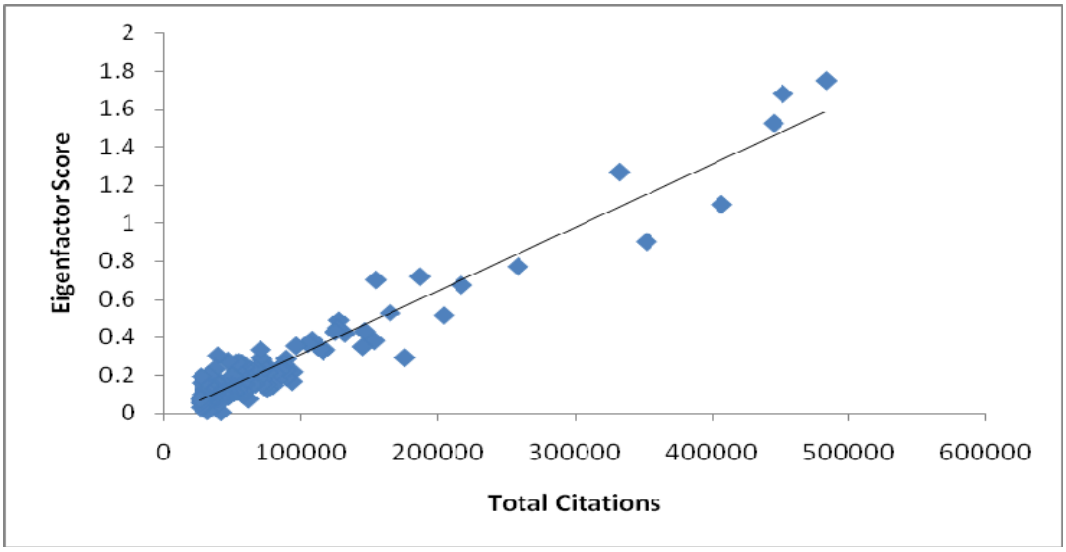
Fersht, A. (2009), The most influential journals: Impact factor and Eigenfactor, *Proceedings of the National Academy of Sciences of the United States of America*, 106(17), 6883-6884 (April 28, 2009).

ISI Web of Science (2010), *Journal Citation Reports*, *Essential Science Indicators*, Thomson Reuters ISI

Figure 1

Eigenfactor Score and Total Citations for 200 Most Highly Cited Journals in Sciences for 2009

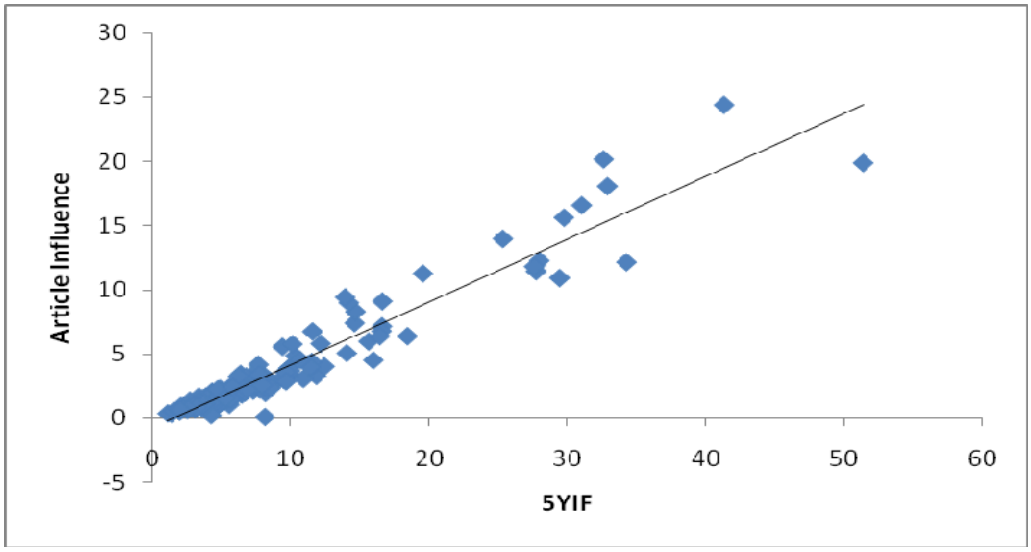


Note: Citations data were downloaded from ISI on 19 June 2010. The OLS regression results are as follows (t-ratios in parentheses):

$$\underset{\text{(-3.42)}}{\text{Eigenfactor Score}} = \underset{\text{(51.59)}}{-0.022 + 3.32\text{E-}06 \times \text{Total Citations}} + \text{error}, \qquad R^2 = 0.931$$

Figure 2

Article Influence Score and 5YIF for 200 Most Highly Cited Journals in Sciences for 2009

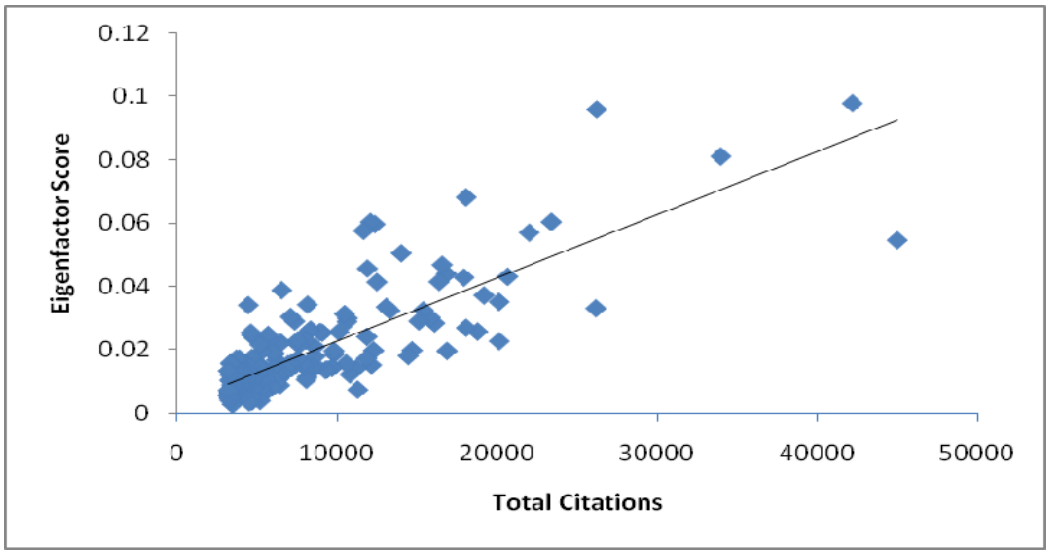


Note: Citations data were downloaded from ISI on 19 June 2010. The OLS regression results are as follows (t-ratios in parentheses):

$$\underset{}{\text{Article Influence}} = \underset{(-6.65.)}{-0.719} + \underset{(48.54)}{0.489} \times 5\text{YIF} + \text{error}, \qquad R^2 = 0.923$$

Figure 3

Eigenfactor Score and Total Citations for 200 Most Highly Cited Journals in Social Sciences for 2009

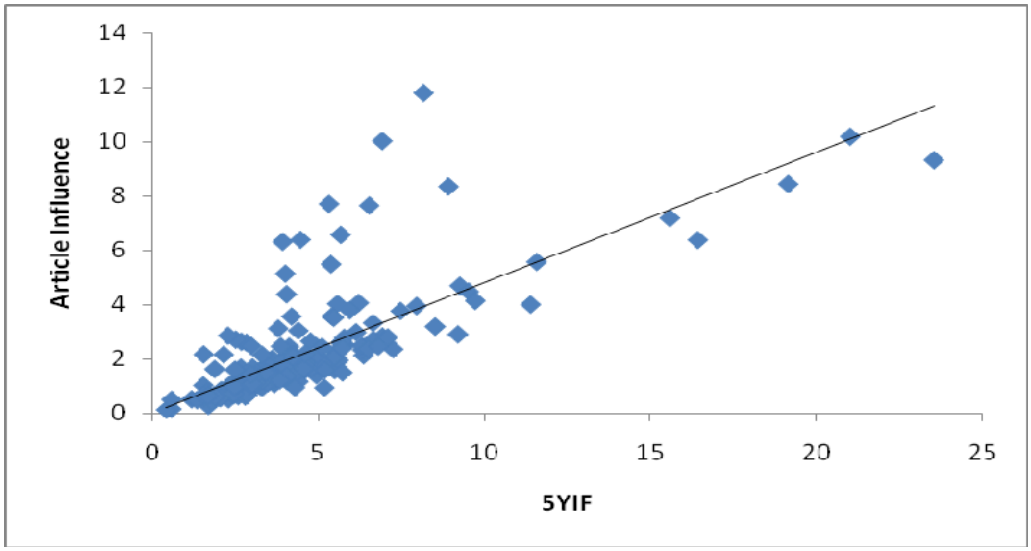


Note: Citations data were downloaded from ISI on 20 June 2010. The OLS regression results are as follows (t-ratios in parentheses):

$$\underset{}{\text{Eigenfactor Score}} = \underset{(2.85)}{0.029} + \underset{(19.55)}{1.99\text{E-}06} \times \text{Total Citations} + \text{error}, \qquad R^2 = 0.659$$

Figure 4

Article Influence Score and 5YIF for 200 Most Highly Cited Journals in Social Sciences for 2009



Note: Citations data were downloaded from ISI on 20 June 2010. The OLS regression results are as follows (t-ratios in parentheses):

$$\underset{}{\text{Article Influence}} = \underset{(0.10)}{0.160} + \underset{(16.25)}{0.479} \times 5\text{YIF} + \text{error}, \qquad R^2 = 0.572$$