

## **A case study: evolution of JASIS' Hirsch index**

Ronald Rousseau

KHBO (Association K.U.Leuven), Industrial Sciences and Technology,  
Zeedijk 101, B-8400 Oostende, Belgium  
E-mail: ronald.rousseau@khbo.be

**Abstract.** The evolution of the Hirsch index of the Journal of the American Society of Information Science over the period 1991-2000 is studied using a variable citation window. A relative h-index is introduced.

The Hirsch index (in short h-index) has recently been defined by Hirsch (2005). A scientific author has a Hirsch index equal to the natural number  $h$  if  $h$  is the largest number of articles published by this scientist having received at least  $h$  citations each. This definition can easily be adapted to journals (in the role of scientists) and article citations (Braun, Glänzel & Schubert, 2005). The Hirsch index is a single measure of visibility of a whole group of articles, incorporating publications as well as citations. It has an advantage over some other simple indicators such as 'number of significant papers' (which is arbitrary), or 'number of citations received by each of the  $q$  most-cited papers' (which also depend on an arbitrary threshold ( $q$ ) and, moreover, is not a single number) (Hirsch, 2005).

The Hirsch index has generally been well-received by the research community (Ball, 2005; Popov, 2005), and even in informetrics (Bornmann & Daniel, 2005; Braun, Glänzel & Schubert, 2005; Glänzel, 2006a, b). The authors of the latter article underline the fact that the h-index is robust in the sense that it is insensitive to an accidental excess of uncited articles, and to one or several extremely highly-cited articles. Of course, the h-index has also a number of disadvantages as pointed out by van Raan (2005) and Glänzel (2006a). The h-index has already been the subject of a number of scientific research papers, see e.g. (Glänzel, 2006b; Egghe, 2006).

In this short contribution we conduct a case study for the variable citation window h-index of the *Journal of the American Society of Information Science* (JASIS: period 1991-2000). By the term variable citation window h-index we mean that we consider a fixed moment in time when citations are collected from the Web of Science (in this case 16<sup>th</sup> October 2005) and hence older volumes have more chance to garner citations. The length of the citation window used for each volume differs. Because of this we expect the h-index to increase when going backward in time. This, however, is not the case as shown in Figure 1.

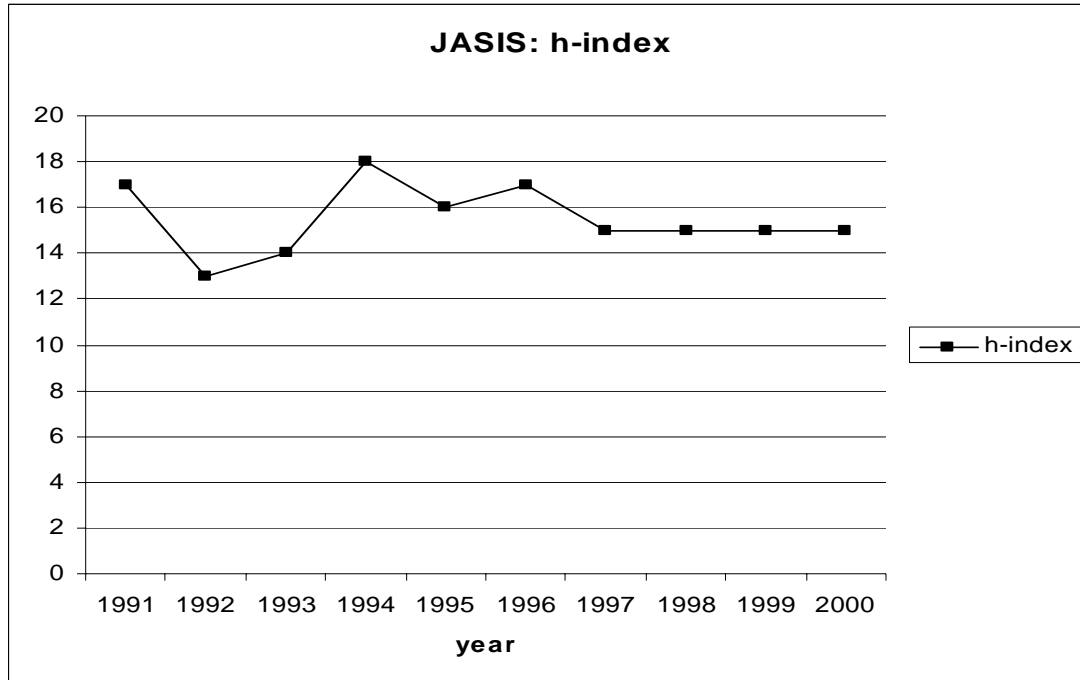


Figure 1. Variable citation window h-index of the Journal of the American Society of Information Science (period 1991-2000)

However, besides the period over which a volume can collect citations, also the number of articles published in that volume influences the h-index. For this reason we divided the h-index by the number of articles published, leading to a relative h-index. In this case the results are somewhat more according to expectations, as shown in figure 2.

Using a relative h-index leads to a linear decrease in time (or increase when going backward in time) as expected. The Pearson correlation coefficient of the regression line is 0.74, which is not high, but statistically significant (5% level). As we have no material for comparison we cannot say if the fact that the relative h-index behaves more according to our expectations than the (absolute) h-index, is a property of the variable citation window h-index, or of this particular journal (JASIS).

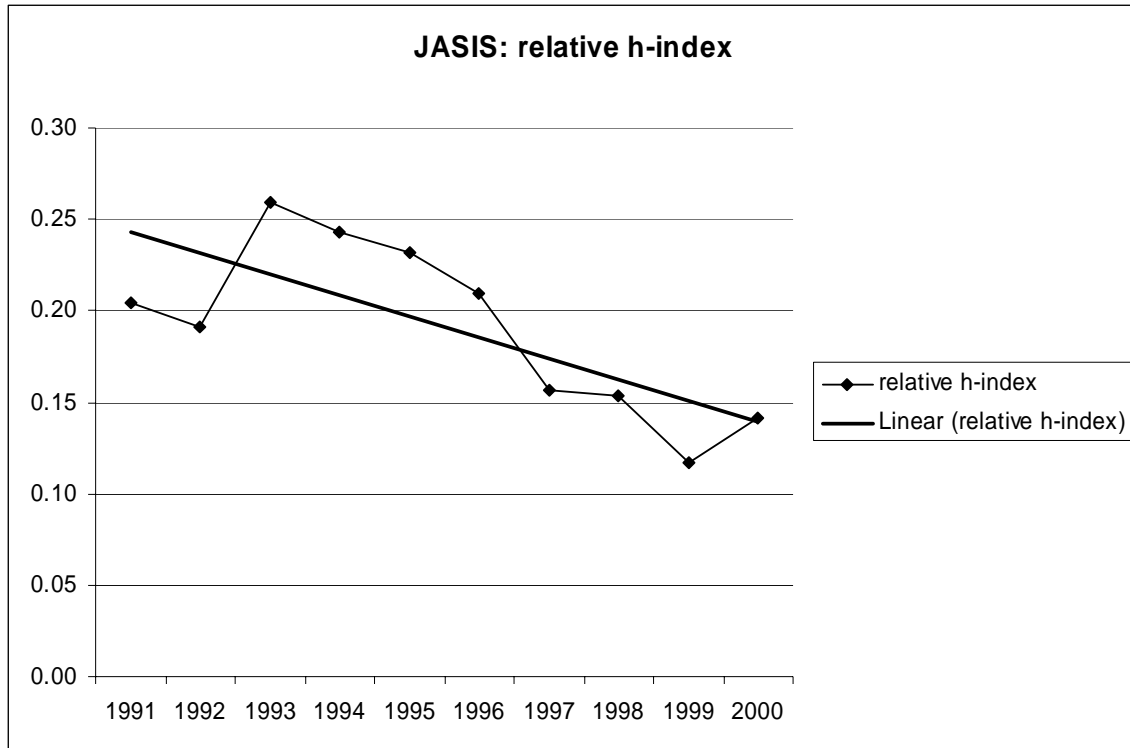


Figure 2. Variable citation window relative h-index of the Journal of the American Society of Information Science (period 1991-2000)

Some further comments related to the idea of an h-index.

An h-index can be calculated for any set of numbers that has a meaningful zero as lowest possible value, and for which the scores are in some sense comparable with the natural ranking. Indeed, in a letter to the editor in *Nature* A.W.F. Edwards (2005) noted that geophysicist Harold Jeffreys used the h-index idea more than 35 years ago for his cycling prowess. His 'h-index' was the number of days that he had cycled h or more miles. Similarly a jogger may count the number of days that he/she runs at least h laps around the stadium. On the other hand bowling scores are not really comparable with natural rankings as it is very easy to obtain a score of 100. So, although there is a natural lower limit of zero, I do not think that many people would feel inclined to calculate a bowling h-index in this way. A possible solution would be to agree that only the number of points above 100 (or another, higher number) is taken into account.

## References

- BALL, P. (2005). Index aims for fair ranking of scientists, *Nature*, 436, p. 900.
- BORNMANN, L. DANIEL, H.-D. (2005). Does the h-index for ranking of scientists really work? *Scientometrics*, 65, 391-392.
- BRAUN, T., GLÄNZEL, W., SCHUBERT, A. (2005). A Hirsch-type index for journals, *The Scientist*, 19(22), p.8.
- EDWARDS, A.W.F. (2005). System to rank scientists was pedalled by Jeffreys. *Nature*, 437, p. 951.
- EGGHE, L. (2006). Dynamic h-index: the Hirsch index in function of time. Preprint.
- GLÄNZEL, W. (2006a). On the opportunities and limitations of the H-index. *Science Focus*, 1 (In Chinese, to appear).
- GLÄNZEL, W. (2006b). On the H-index – a mathematical approach to a new measure of publication activity and citation impact. *Scientometrics*, 67(2). In press.
- HIRSCH, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences of the United States of America*, 102, 16569-16572.
- POPOV, S.B. (2005). A parameter to quantify dynamics of a researcher's scientific activity. arXiv:physics/0508113
- VAN RAAN, A.F.J. (2005). Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups, arXiv:Physics/0511206.

This preprint is a revised version of a contribution submitted to *Science Focus* on 29 November 2005. The author thanks Jin Bihui, Leo Egghe and Wolfgang Glänzel for interesting comments.