

DESCRIPTION OF SCIMAGO JOURNAL RANK INDICATOR

The Scimago Journal Rank (SJR) is based on the transfer of prestige from a journal to another one; such prestige is transferred through the references that a journal does to the rest of the journals and to itself.

The calculation of the final prestige of a journal is an iterative process, in which the prestige in the stage i of a journal depends on the prestige of the set of journals in stage $i-1$.

$$SJR_i = \frac{(1-d-e)}{N} + e \cdot \frac{Art_i}{\sum_{j=1}^N Art_j} + d \cdot \sum_{j=1}^N \frac{C_{ji} \cdot SJR_j}{C_j} \cdot \frac{1 - \left(\sum_{k \in \{Dangling-nodes\}} SJR_k \right)}{\sum_{h=1}^N \sum_{k=1}^N \frac{C_{kh} \cdot SJR_k}{C_k}} + d \cdot \left[\sum_{k \in \{Dangling-nodes\}} SJR_k \right] \cdot \frac{Art_i}{\sum_{j=1}^N Art_j}$$

$$SJRQ_i = \frac{SJR_i}{Art_i}$$

SJR_i - Scimago Journal Rank of the Journal i .

C_{ji} - Citation from journal j to journal i .

C_j - Number of References of journal j .

d - Constant, normally 0.85.

e - Constant, normally 0.10.

N - Number of Journals

Art_j - Number of Articles of journal j

Stages

The calculation of the SJR involves three stages:

- 1) Initial assignation of the SJR : in this stage a default prestige is assigned to every journal. Having in mind that the SJR is calculated from an iterative process which is based on the values assigned in the previous step, it is necessary to have some initial values. The calculation of the JR is a process that converges, so these initial values doesn't determine a final result, but just influence in the number of iterations needed

- 2) Iteration process of calculation: departing from stage 1, the computation is iterated to calculate the prestige of each journal based on the prestige transferred by the rest. The process ends when the variation of the *SJR* between two iterations is less than a limit prefixed before the calculation process. The final result is the *SJR* of each journal
- 3) Computation of *SJRQ*: After the stage 2 each journal has computed its *SJR*, indicator of global prestige of a journal. To obtain the *SJRQ* indicator we divide the *SJR* by the number of articles published in the citation window. The result is the prestige average per article, since logically the prestige obtained by a journal is the result of the prestige obtained by its articles. So, it could be compared the prestige average per article without having in mind other factors like the frequency of each journal, the number of articles, etc.

Variables of each journal

- 1) Number of articles of a journal: the number of articles published in the citation window. The number of articles influences in:
 - a) Determines the addend 2 in the stage 2.
 - b) Determines the amount of prestige which is received from the dangling nodes addend 4) in the stage 2.
 - c) The Computation of *SJRQ* in stage 3.
- 2) Number of total references of a journal: The amount of prestige that a journal *X* transmits to another *Y* comes determined by the division between n° of references from *X* to *aY* by the n° total of *references of X*. It is to say, the prestige a journal transmit to another journal depend on both the number of references from *X* to *Y*, and on the total number of references of *X*. The total number of references of a journal includes both those directed to journals of the universe considered and those directed to journals outside this universe
- 3) Number of cites received by a journal *X*: the prestige that any journal receives depends on the number of citations that receives from the other journals; the bigger the number of citations to a journal the bigger will be the prestige of that journal

Global Values

- 1) Limit of convergence: $abs(SJR_{i+1} - SJR_i) < Limit$. When this is fulfilled for all journals we stop the calculation process.

- 2) Number of Journals (M): Its value corresponds with the total number of journals considered in the calculation; its value will be different if it varies the universe of journals considered. It determines the addend 1, is to say the minimum amount of prestige that has each journal of the universe.
- 3) Global number of articles: it is the sum of all articles of the journals that are considered in the calculation published in the three years window. It influences in addend 2 and 4.
- 4) Constants d , and $(1-d-e)$: constants that determine the weight of the four addend of the formula of the SJR.
- 5) Dangling Nodes: they are journals of the universe that do not have references to any other journal of the universe, although can be cited or not. They constitute impasses in a graph since from them it is not possible to jump to other nodes. In order to assure that the iterative process is convergent, dangling nodes virtually are connected to all those of the universe and its prestige is distributed between all the nodes (addend 4) proportionally the number of articles of each one.

Description of the formula

- Addend 1: It corresponds with the minimum prestige that is going to have any considered journal, independently of any other factor (n° of articles, citations...). It depends directly on the number of journals of the universe.
- Addend 2: Prestige that obtains a journal due to n° of articles published in the three years window. It depends on both the number of articles published by the journal and the sum of all articles of all the journals of the universe

Addings 1 and 2 are constant in all the iterations, together form the minimum prestige that receives a magazine.

- Addend 4: It is the prestige that obtains a journal of dangling nodes. The amount of prestige to distribute is the sum of the prestige of all dangling nodes in the previous iteration. The prestige that a concrete node receives is directly proportional to the n° of articles published by the journal. A journal with more published articles receives more prestige of dangling nodes than another one with fewer articles.
- Addend 3: It is the prestige that obtains a journal of the journals that mention it. The percentage of the prestige that a journal X transfers to another one Y is constant in all the iterations, and depends on n° of connections of journal X to the total journal Y/n° of connections of journal X . The amount of prestige transmitted by a journal depends on that constant and the value of the JR in the previous iteration.

Is fulfilled that the number of references of a journal X to all the other journals of the universe is smaller than the total number of references, what implies that part of his prestige is not distributed. As consequence the system does not converge. In order to solve this problem it appears a corrector factor in addend the 3, this factor is common to all the journals that receive citations. This is used to distribute between the mentioned journals of the universe the prestige corresponding to the citations that go outside that universe. This prestige is distributed proportionally to the obtained from the citations.