Relationship between Downloads and Citations

The Case of Two Economics Journals

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For many decades citations were the main source when analyzing the research impact of science. It was the aim of this master thesis to explore if downloads and so-called readership data from Mendeley are possible alternatives to citation data and if downloads can be used to forecast the citation impact in future years. The study is based on articles of the Journal of Environmental Economics and Management (JEEM) and the Journal of Financial Economics (JFE) published from 2002 to 2011, and compares the downloads (2002 to 2011) from ScienceDirect, the citations (2002 to 2016) from Scopus and the readership data (2008 to 2015) from Mendeley.

Scopus (2016) is an abstract and citation database, which includes at the moment of writing more than 60 million journal articles. ScienceDirect (2016) is a full-text database. Mendeley (2016) is a free reference manager and an academic social network service.

The analysis of the data sources shows a difference between the document types of Scopus and ScienceDirect though both are produced by Elsevier. An additional outcome of this study is, that more than 60 per cent of the documents were downloaded in PDF format and less than 40 per cent in HTML format. According to the number of readership, students are by far the big-

gest user group. A significant difference exists in the obsolescence of downloads and citations: While the download maximum usually occurs for recent articles, it takes several years until the citation maximum is reached. An additional outcome of this study is that for the analyzed journals electronic articles are usually published prior to print articles. As a consequence, it may happen that a few articles are also cited before print publication.

Figures 1 and 2 show the relationship between downloads, citations and readership. To quantify the relationship, Spearman rank correlation was calculated. The results show a medium to high correlation between citations and downloads ($r = 0.62$ for Journal of Environmental Economics and Management – JEEM, $r = 0.79$ for Journal of Financial Economics – JFE) and between readership frequencies and citations ($r = 0.67$ for JEEM, $r = 0.66$ for JFE). The correlation between readership and downloads is medium sized and clearly lower ($r = 0.56$ for JEEM, $r = 0.58$ for JFE)
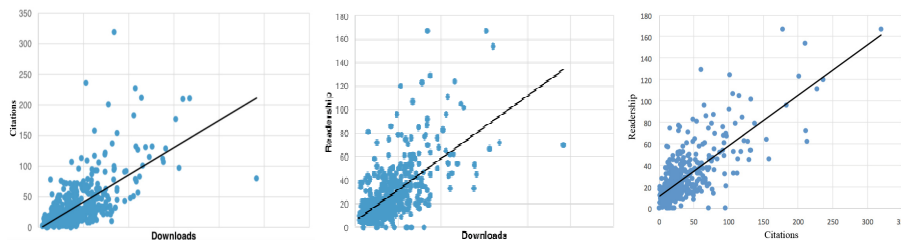

Fig. 1 Downloads vs. citations vs. readership, scattergram for "Journal of Environmental Economics and Management", publication year (2002–2011), full length article ($n = 509$)
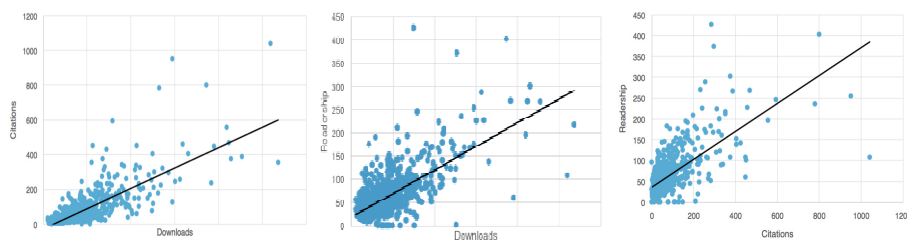

Fig. 2 Downloads vs. citations vs. readership, scattergram for "Journal of Financial Management", publication year (2002–2011), full length article ($n = 868$)

In order to check a possible predictability of citations, I replicated an approach which was originally proposed by Kurtz et al. (2005). The results of this analysis indicate that the journal downloads can be used as a forecast for citations. Looking at all download classes in table 1 and identifying the most

likely number of citations for each shows that an increase of the download class usually goes along with an increase of the citation class. It follows that downloads can be used as a rough approximation for (future) citations. However, this does not mean that downloads can be a substitute for citations.

Table 1: Downloads (2002–2011) vs. citations (2002–2016) for FLAs published from 2002 to 2011, Journal of Financial Management (n = 870 FLAs)

Number Citations	Downloads (2002- 2011)						Total
	512-1023	1024-2047	2048-4095	4096-8191	8192-16383	>=16384	
0	1			2			3
1		1					1
2-3	7	8	1				16
4-7	10	14	8	1			33
8-15	6	62	44	6			118
16-31	7	55	118	20			200
32-63	3	17	117	62	3		202
64-127		1	52	104	14		171
128-255			6	55	26	1	88
256-511				10	16	6	32
512-1023				1	2	2	5
1024-2048						1	1
Total	34	158	346	261	61	10	870

References

Kurtz, M. J., G. Eichorn, A. Accomazzi, C. Grant, M. Demleitner, S. Murray, N. Marimbeau, and Elwell, B. (2005): The bibliometric properties of article readership information. In: *Journal of the American Society for Information Science and Technology* 56 (2), 111–128.