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Measuring the impact of accounting journals using *Google Scholar* and the *g*-index

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ABSTRACT

The UK's proposed Research Excellence Framework promotes a move towards citation analysis for assessing research performance. However, for business disciplines, journal rankings are likely to remain an important aid in evaluating research quality. The accounting literature includes many journal rankings and citation studies, however there has been little coverage of recent advances in these areas. This study explores approaches to assessing the impact of accounting journals with a focus on quantitative measures as a complement to peer-review-based evaluation. New data sources and techniques for citation studies are reviewed, and the *g*-index is selected for further analysis. The *g*-index was developed by Professor Leo Egghe in 2006 as an improvement on the *h*-index. Like the *h*-index, the *g*-index represents a relationship between papers published and the level of citations they receive, but the *g*-index is more sensitive to highly cited paper. To apply the *g*-index to accounting journals, the study first combines eight published journals rankings to produce a list of 34 highly-regarded titles. Citation data are then gathered from *Google Scholar* and used to calculate *g*-index scores as the basis of a new ranking. *Google Scholar* is found to have broader coverage of accounting citations than *Scopus* or the Web of Science databases, but requires cleaning to remove duplicate entries. The use of the *g*-index for ranking journals is found to be a useful innovation in citation analysis, allowing a more robust assessment of the impact of journals.

1. Background

In many countries, journal rankings are used to assess research performance and, therefore, can influence career progression and funding for universities. As a consequence, accounting academics are under increasing pressure to publish specifically in 'top tier' journals as identified by ranking studies.[2] Given this context it is not surprising that journal ranking studies are relatively common in the accounting literature (for example, Ballas & Theoharakis, 2003; Beattie & Goodacre, 2006; Herron & Hall, 2004; Chan & Liano, 2009). Alongside the interest in journal ranking studies, citation data have also been a popular basis for analysing accounting research (for example, Brown & Gardner, 1985; Krogstad & Smith, 2003; Milne, 2001; Wakefield, 2008). Outside the accounting discipline, new tools have emerged for citation analysis over the last five years. The traditional sources of citation data are those provided by Thomson Scientific: The *Science Citation Index* (*SCI*), *Social Sciences*

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[2] For discussion of the 'publish or perish' phenomenon and the pressure to publish in top tier journals see Ballas and Theoharakis (2003), Bonner, Hesford, Van der Stede, and Young (2006), Brinn, Jones, and Pendlebury (2001), Brown, Jones, and Steele (2007), Chow et al. (2006).

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Citation Index (*SSCI*), and *Journal Citation Reports* (*JCR*), but alternatives such as *Google Scholar* and *Scopus* are becoming popular (for example see Ball & Tunger, 2006; Gray & Hodkinson, 2008; Law & Veen, 2008; Neuhaus & Daniel, 2008).

As citation data have become more available, new formulae for analysis have developed. The best known of the new formulae are the *h*-index (Hirsch, 2005) and *g*-index (Egghe, 2006). These new indices have been applied and modified in various studies (for example, Bar-Ilan, 2008; Jacsó, 2008; Jin, Liang, Rousseau, & Egghe, 2007; Ronald & Fred, 2008); and incorporated into online resources including *Scopus*, *SSCI* and Harzing's *Publish or Perish* software (Harzing, 2008). Despite the popularity of the new tools for citation analysis, there has been little discussion within the accounting literature of these alternative sources of citation data or the value of the *h*-index or *g*-index to the discipline.

The original aim of both the *h*-index and *g*-index was to facilitate useful comparisons of the impact or importance of individual researchers (Egghe, 2006; Hirsch, 2005). Evaluation at the level of individuals is useful, however evaluation at the journal level is more practical for large scale assessment of research outputs, such as those carried out by universities and funding agencies. For example, based on the number of submissions to the UK's Research Assessment Exercise (RAE), it is likely that journal rankings were used as a proxy for assessing the quality of articles by some subject panels (Geary, Marriott, & Rowlinson, 2004).[3] Journal rankings have several applications beyond research assessment schemes (Baumgartner & Pieters, 2003; Marsh & Hunt, 2006), including providing a basis for selecting journals for consultation or for subscription. Rankings can also be a guide as to the perceived quality of an article when a piece of research is assessed by someone unfamiliar with the topic. Finally, journal rankings also assist authors to identify possible outlets for their research.

From 2013, the UK's RAE will become the Research Excellence Framework (REF) and will include a move towards more quantitative assessment of publications (Higher Education Funding Council for England (HEFCE), 2009). The HEFCE has recommended that some subject panels (for example, medicine and computer science) should assess research outputs through citation data for individual publications, while other panels are to consult with their 'communities' before determining whether they will use article citation data (HEFCE, 2009).

The HEFCE's proposals for the REF currently outline a five year period of evaluation, and suggest that only material published in the year prior to each assessment should be considered too new to have been cited (HEFCE, 2009). Such an approach may lead to problems in using article-level citation data to assess business publications. It is well-known that the number of years from the time research appears in print to when it becomes widely cited can vary across fields of study (Egghe & Rousseau, 2000; Garfield, 2000), and the average age of citations within business articles has been found to be as high as 10–11 years (Nederhof, 2006; Tahai & Meyer, 1999). As a consequence of these time lags, the journal in which an article is published may need to remain a proxy for the quality of accounting research, therefore journal rankings are likely to remain important to the discipline.

There is much debate concerning whether opinion survey or citation analysis is the best method for ranking journals (reviews of the different viewpoints are provided by Jones, 1999; Lowe & Locke, 2005; Wakefield, 2008). Brinn, Jones, and Pendlebury's (2000) large survey of accounting academics showed overwhelmingly that peer-review approaches are considered to be better measures of journal quality than citation analysis. However, despite the preferences of academics, the REF demonstrates clearly that there is a move towards quantitative measures – as Hirsch points out, "In a world of limited resources, such quantification (even if potentially distasteful) is often needed for evaluation and comparison purposes" (2005, p. 1). Given this context, it is in the accounting discipline's interests to explore new approaches to quantitative assessment of research outputs.

The purpose of this study is to review the strengths and limitations of different data sources and approaches used for citation analysis, and to apply these tools to accounting journals. Eight journal rankings are combined to produce a list of highly-regarded accounting titles. Citation data are gathered for each journal from *Google Scholar*, and *g*-index scores are calculated to reveal which accounting journals have the greatest impact. This application of the *g*-index is an innovation in citation analysis and presents an interesting advance in the quantitative assessment of research impact.

The structure of our paper is to first provide a brief overview of citation analysis, including a review of the Impact Factor, *h*-index and *g*-index formulae. We follow this with a comparison of the three major data sources for accounting citations: *Web of Science*, *Scopus* and *Google Scholar*. The fourth and fifth sections of the paper present the methodology and results from our main empirical work. Finally, we discuss the implications of our findings, and present some concluding remarks and suggestions for future research.

2. Citation analysis

Supporters of citation-based journal rankings suggest that citation analysis is the most objective way to measure the impact, importance or peer recognition of researchers and/or their research outputs (for example, see Beattie & Ryan, 1989; Brown & Gardner, 1985; Wakefield, 2008). However, critics raise many concerns related to citation analysis – some of the common criticisms are summarised in Table 1.

It is important to note that, within the accounting discipline, some of the criticisms of citation analysis are in fact criticisms of *SSCI's* poor coverage of accounting journals or are criticisms of specific analytical approaches (for example, Ballas & Theoharakis, 2003; Brown, 2003; Lowe & Locke, 2005) rather than criticisms of citation analysis *per se*. As noted earlier,

[3] At a meeting of Professors in Accounting and Finance in Manchester, September 2009, members of the 2008 RAE Accounting and Finance sub-panel stated that submitted articles were assessed on their merits rather than by means of proxies such as journal rankings. This was confirmed by Ashton et al. (2009) in a paper on the 2008 Research Assessment Exercise cited in the current issue of the British Accounting Review.

Table 1
Common criticisms of citation-based journal rankings.

Criticism	Explanation/discussion
Citation does not reflect quality or influence (Brinn, Jones, & Pendlebury, 1996a).	Citation analysis is sometimes misleadingly discussed in terms of measuring 'quality' (For example, Gamble & O'Doherty, 1985). Citation analysis is a measure of impact, and should not be interpreted as a direct representation of quality.
An article can be cited for reasons other than a positive evaluation of its content (Baumgartner & Pieters, 2003, Brinn et al., 1996a; Jones, Brinn, & Pendlebury, 1996b; Martens, 2003).	Citations can be perfunctory or for acknowledgement rather than evaluation (Martens, 2003; Small 1982). Citations are also sometimes strategic, for example, to cater to potential reviewers (Baumgartner & Pieters, 2003). However, it is argued that a cited article contributes to the interchange of ideas that advances a discipline's knowledge base, and thus, the article is influential regardless of the manner in which it is cited (Beattie & Ryan, 1989; Brown & Gardner, 1985).
Citation rates are affected by different practices across fields of study and in different countries (Starbuck, 2003; Thomson Scientific 2008b).	Some business specialties include more citations per article, leading to a systematic bias in their citation rates (Starbuck, 2003). Language, journal history, journal format, and journal publication schedule can also all affect citation rates (Thomson Scientific, 2008b). This makes comparisons across disciplines difficult.
Self-citation inflates citation figures (Brown & Gardner, 1985; Gamble & O'Doherty, 1985).	While self-citation (authors citing themselves, or the journal in which their paper appears) can bias results, it is more a problem in the sciences than social sciences (Aksnes, 2003). This is supported by Tahai and Meyer's (1999) study which found that the average level of self-citation for management journals was only 5%. Self-citations can also often be removed from a data set.
There are difficulties in attributing citations to the correct researcher (Jones, Brinn & Pendlebury 1996)	Different forms of authors' names cause difficulty in some forms of citation analysis. However, this limitation is not relevant to citation analysis applied at the journal-level.
The 'halo effect' (Brown & Gardner, 1985; Hudson, 2007; Wakefield, 2008), or 'Matthew effect' can bias the selection of articles to cite (Merton, 1973; Small, 2004)	The phrase 'halo effect' is used in two different ways in relation to citations: First, highly cited papers can raise the profile of other papers in the same issue/journal because they draw attention to them (Hudson, 2007). Hudson (2007) points out that this does not cause problems with journal-level analysis, and that the growing use online journals and search engines means that the 'halo effect' is no longer important. Second, once an author/article is cited, they are more likely to be cited again. The phenomenon of people favouring well-known writers, is also referred to as the "Matthew Effect" (Merton, 1973). Citation can operate like 'expert referral' with people taking more notice of an article because it has already been cited (Small, 2004). Popular authors can also be cited as a means of giving credibility to the citing author (Brown & Gardner, 1985; Gamble & O'Doherty, 1985).

alternative techniques and data sources have emerged for citation analysis recently and these have not yet been applied widely to accounting literature. These techniques and sources will be discussed in more detail in the following sections.

2.1. Journal impact factor

In those contexts where a quantitative measure of impact is appropriate, it is accepted that formulae to analyse citation data provide a better indication of impact than a simple count of citations (Egghe & Rousseau, 1990). The Impact Factor is the best known of such formulae and has been widely used for many decades (Egghe, 2000; Garfield, 2000). Garfield developed the Impact Factor in the early 1960s and it is published within Thomson's Web of Science databases, specifically in the *Journal Citation Reports (JCR)*. The Impact Factor used in *JCR* is calculated by dividing the total numbers of citations to a particular journal within the year of the particular edition of the *JCR*, by the total number of articles published in that journal in the two previous years (Thomson Scientific, 2008b).[4]

The publishers of the Impact Factor suggest it offsets any advantage a journal may gain by being old or by publishing large or numerous issues because the total number of articles published cannot bias the calculation (Thomson Scientific, 2008b). However, the use of citation data from only a single year, and citation to only two previous year's articles is a significant limitation of Impact Factors (Bollen & Sompel, 2008; Reedijk & Moed, 2008). Even Garfield acknowledged that "the average paper is not cited for two or three years" (Garfield, 2000, p. 374), and, as was noted earlier, the average age of citations within many business articles is 10–11 years. Therefore data gathered one and two years post publication is likely to provide an unrepresentative snapshot of impact.

Another problem with the use of the Impact Factor is that the quality of articles varies within a journal, resulting in citation distributions that are positively skewed with only a few articles close to the population mean. This variation between articles from the same journal means the Impact Factor is distorted by a small number of highly cited articles (for discussion of this issue see Egghe & Rousseau, 2008; Garfield, 2000; Weale, Bailey, & Lear, 2004).

[4] The formula for the Impact Factor is as follows, $IFj^{y} = (CyAj^{y-1} + CyAj^{y-2})/(Aj^{y-1} + Aj^{y-2})$, where A is the number of articles, C is citations to a particular journal (j), and y is the year of the edition of the *JCR*.

2.2. The h-index

As previously mentioned, the *h*-index has been widely applied outside the accounting discipline, and it has made a significant impact on scientific thinking (Egghe, 2008; Saad, 2006). The *h*-index was developed by Hirsch in 2005 as a way to assess the impact of an individual author without the skewed citation distribution affecting results to the extent that it does in the Impact Factor calculation (Hirsch, 2005).

The *h*-index reflects both overall publications and the level of citation of those publications. Put more precisely, the *h*-index is the point at which *h* of the author's papers (p) have at least *h* citations each and the other papers ($N \cdot p - h$) have no more than *h* citations each (Hirsch, 2005). The meaning of the *h*-index is best explained through a description of its calculation. The easiest approach to calculating the *h*-index is to first rank papers in a table in descending order by the number of citations they have received. The last row of the table where the number of citations is equal to or greater than the number of publications determines the *h*-index for that researcher. Columns 1 and 2 of Table 2 illustrate the calculation of the *h*-index for a hypothetical author (the other two columns in Table 2 are not required for the *h*-index – see Section 2.3 below). The *h*-index score for the example is 12 because that is the point at which the number of publications (r) is equal to or less than the total number of citations (TC) it received.

The *h*-index can be applied to journals as well as researchers (Egghe, 2008; Saad, 2006) and presents two main advantages over the Impact Factor as a tool for ranking journals: First, the *h*-index can cover as many years of articles and citations as desired and available so is not as affected by a time lag between publication and citation of material. Second, the *h*-index is not as affected by a small number of articles with very low or high numbers of citations (Egghe, 2008) and so presents a better overview of the impact of the journal over time. However, this second advantage can also be considered a limitation (Egghe, 2008) – while one would not want a small number of uncited or highly cited articles to overwhelm the score that an individual or journal receives, it could be argued that even small numbers of highly cited articles should not be completely ignored in any rating system.

2.3. The g-index

The *g*-index proposed by Egghe (2006) responds to the problem that the *h*-index is insensitive to highly cited articles. Egghe (2006) believes that a measure of the quality of a scientist should not ignore the performance of their most influential articles. He defined the *g*-index as the highest number of papers that together received g^2 or more citations (2006). The higher the number of citations awarded to the best articles (in other words, the more skewed the citation distribution) the higher the *g*-index. Expressed formally, the *g*-index is the highest r^2 (r being the number of publications) where $\Sigma TC \geq g^2$, when TC is the total number of citations, and g is the *g*-score, found by locating the value of g^2 that is the last value smaller than or equal to the ΣTC, the cumulative sum of all citations (Egghe, 2006). However, it is easier to understand the *g*-index through an example and Table 2 provides an example of calculation of the *g*-score alongside the *h*-index. The first step is the same as for the *h*-index with publications (column 1) listed in descending order of number of citations they received (TC). To calculate the *g*-index two additional columns are required: the square of the number of the article, and the cumulative sum of citations

Table 2
Example of *h*-index and *g*-index calculation.

Data for *h*-index		Data for *g*-index	
Article r	Citations TC	Article Squared r^2	Cumulative Citations ΣTC
1	50	1	50
2	40	4	90
3	33	9	123
4	21	16	144
5	20	25	164
6	19	36	183
7	17	49	200
8	15	64	215
9	15	81	230
10	14	100	244
11	13	121	257
$h = 12$	**12**	144	269
13	12	169	281
14	10	196	291
15	9	225	300
16	8	256	308
$g = 17$	8	**289**	**316**
18	7	324	323
19	6	361	329
20	4	400	333

(columns 3 and 4 in Table 2). The *g*-index in the example in Table 2 is 17 because the row of the 17th article is last row where r^2 (289) is less than or equal to the cumulative sum of citations ΣTC (316).

The advantage that the *g*-index provides over the *h*-index is easily appreciated if one considers a hypothetical example. If Wilson has published ten articles and each has received four citations, Wilson's *h*-index is four. If Roberts has also written ten articles and nine of them had received four citations each, but the other was more highly cited, Robert's *h*-index would be four like Wilson's regardless of how many citations the tenth article had received. On the other hand, the *g*-index would vary depending on how many citations that tenth article had received: If it had received twenty citations Robert's *g*-index would be six, and for fifty citations, the *g*-index would be nine.

Intuitively, it seems appropriate for a few highly cited articles to have influence on the final score that a researcher or journal receives. The *g*-index appears to provide a clearer assessment of the overall impact of a body of research, while providing the same advantages over the Impact Factor as the *h*-index. As a consequence, the *g*-index has been well accepted within the informetrics literature (for example see Woeginger, 2008).

3. Citation data sources

Formulae for assessing the impact of research are clearly only as good as the data to which they are applied. Data from *SCI* or *SSCI* are so commonly used for citation analyses that in the past the term citation analysis could seen as synonymous with those databases (Klein & Chiang, 2004). However, there are now alternatives for obtaining citation data, and we will briefly review the major sources.

3.1. JCR *and* SSCI *(web of science)*

Originally created by Garfield in the 1960s, Thomson Corporation now publishes *SSCI* and *JCR*. *SSCI* includes "2474 of the world's leading social sciences journals" (Thomson Reuters, 2009b) and "fully indexes over 2100" of those titles (Thomson Reuters, 2009c), while *JCR Social Sciences* 2008 edition includes "more than 1900 leading journals" (Thomson Reuters, 2009a). The reason for the different coverage is that *JCR* lags a year behind *SSCI* and includes only titles that have been indexed in *SSCI* for at least three full years (N. Devadas, Thomson Reuters, personal communication, July 22, 2009). Therefore, while the databases are closely related, at any given time *JCR* contains only a subset of the titles in *SSCI*.

There are suggestions that there are biases in the two databases, such as that they include proportionately more publications from the USA than elsewhere (Egghe & Rousseau, 1990), and that they favour journals which display a particular ideology (Klein & Chiang, 2004). If the databases do not cover international accounting literature broadly then when they are used for research assessment exercises, some types of academics will clearly be disadvantaged, therefore it is important to examine coverage closely.

Bradbury, Weightman, Morgan, and Turley's (2009) study of bibliometric data sources searched for the 'top100 accounting and finance journals' and found that 39% were indexed in *SSCI*. *JCR* does not include a subject heading for accounting, but has been reported as including only 10% of accounting titles (Brown, 2003). In the raw data gathered in our main study (described later), sixteen (36%) of the forty-five accounting and finance journals studied were found to be indexed in *JCR*. In both cases, the sample of titles searched was a selected list of the 'top' journals rather than all of the discipline's scholarly journals. A broader comparison of the number of discipline-specific scholarly journals in *Ulrich's International Periodicals Directory* (2008) and those in *JCR* was conducted across several disciplines and results are presented in Table 3. *Ulrich's* lists 86 refereed academic accounting journals, which seems a reasonable estimate in light of Zeff's (1996) earlier estimate of 77 accounting journals. We found only sixteen accounting and finance journals in *JCR*, which suggests that *JCR* may index as few as 19% of the current scholarly accounting journals (a generous estimate given the *JCR* total in Table 3 includes finance journals).

Table 3
Discipline coverage in Ulrich's compared to *JCR*.

Discipline	Active academic refereed titles in Ulrich's (2008)	Titles in *JCR* (2007 editions)	Proportion of Ulrich's titles in *JCR*
Economics	234	191	82%
Chemistry	752	448	60%
Physics	757	310	41%
Finance	142	45	32%
Women's studies	109	28	26%
Public administration	111	27	24%
Management	467	96	21%
Accounting	**86**	**16**[a]	**19%**
Anthropology	336	58	17%
Sociology	579	96	17%
Social work	198	29	15%

[a] The number of accounting titles in *JCR* is an estimate only as *JCR* does not include accounting as a subject heading. The estimate is based on searching *JCR* for the journals compiled later in this study.

3.2. Scopus

The *Scopus* citation tracking tool was launched in 2004 by Elsevier and made available via the ScienceDirect suite of databases. Coverage of social sciences amounts to about 2850 titles (Elsevier B.V., 2008) and this suggests broader overall title coverage than *JCR* and *SSCI*. An examination of accounting and finance journals suggests that the coverage of these disciplines is also broader than in *JCR*, with thirty-one of the forty-five journal titles that were in this study's raw data being indexed in *Scopus* (compared to only sixteen in *JCR)*.

While *Scopus'* breadth of title coverage appears to be good, it is important to look also at the depth of coverage. Of the thirty-one accounting and finance journals indexed in *Scopus*, only nineteen have coverage of more than four years, and for those nineteen with the broader date range, coverage is only back to 1996. This limited date coverage restricts the usefulness of *Scopus* to accounting academics, particularly given the time lag for citations in business literature discussed earlier.

3.3. Google scholar

Two weeks after *Scopus* was launched in 2004 *Google Scholar* was made available as a gateway to scholarly literature (Bar-Ilan, 2008). *Google Scholar* provides two main advantages over subscriber databases like *JCR* and *Scopus*: (1) it has wider coverage, and (2) it is readily available and free of charge. *Google Scholar* content is not organised under subject headings so subject coverage cannot be easily assessed. However the database makes use of many abstracting and indexing sites and so certainly includes a broader range of sources than either *JCR* or *Scopus* (though less historical data than *JCR*) (Jacsó, 2005). As Harzing (2008) notes, *Google Scholar*'s broader coverage leads to criticism, specifically accusations of inclusion of non-academic sources. However Harzing (2008) does not find significant numbers of non-academic results in her own use of *Google Scholar*, rather she found that the non-journal sources that *Google Scholar* includes are items such as conference papers, academic books and working papers, which may in fact be considered 'academic', but not necessarily peer-reviewed.

Another limitation of *Google Scholar* is that it lacks authoritative indexes so variant forms of titles, duplicate entries and other errors are likely to occur more often than in a controlled database (Bar-Ilan, 2008; Jacsó, 2005). Harzing (2008) points out that some of the comments regarding errors in *Google Scholar* relate to its use in keyword searches, therefore a search for a specific item, such as a journal title, would not face the same difficulties. She also suggests that *h*-index and *g*-index calculations are not sensitive to the type of errors contained in *Google Scholar*. However, variant forms of authors' names or article titles can clearly create problems when using *Google Scholar*. Bradbury et al.'s (2009) study found *Google Scholar* "unworkable" when searching for citations for two specific accounting authors. Similar to Bradbury et al's (2009) study, Bar-Ilan (2008) and Jacsó's (2005) criticisms of *Google Scholar* are based on the study of citations related to a particular researcher, or citations of specific articles. When searching for citations for a journal rather than author or article, *Google Scholar* is less problematic because the advanced search feature offers both 'phrase' searching and the ability to search for articles from a particular publication (Google, 2009).

A further limitation of *Google Scholar* is that it is not clear how often new material is added, nor which sources are included or excluded (Bar-Ilan, 2008; Harzing, 2008). In particular *Google Scholar* does not indicate what date ranges are captured. Differing date ranges across publications could lead to slight changes in ratings, though across a whole journal this should have minor impact.

A final concern in the use of *Google Scholar* is the extra time involved in downloading and cleaning the data. Meho and Yang (2007) estimated that collecting and processing data was 30 times more time consuming for *Google Scholar* than with alternative citation data sources. Meho and Yang's (2007) study was of individual authors and articles and so some of the processing time would be due to the difficulties involved in searching authors' names within *Google Scholar*, a issue which is not relevant to journal-level analysis. However some of the extra processing time is likely to have been due to the absence of file download options (data is captured by copying each screen). The key issue is whether the coverage of *Google Scholar* is worth the extra effort involved in data gathering and cleaning. We conducted a simple comparison of the citation databases in order to assess this.

3.4. Comparison of citation databases

As evident from Table 3, the quality of discipline coverage varies within *JCR*, with economics and science fields being far better represented than accounting or social science disciplines. This variation would appear to also exist within *Scopus*, as, according to Ball and Tunger's (2006) comparison of *Scopus* and *JCR*, the databases have depth in different subject areas and citation counts vary as a result. This means that evaluations of the databases carried out within other disciplines are not able to be generalised.

To explore coverage of citations of accounting journals across the three citation data sources, a convenience sample of ten varied accounting journals was chosen for a simple exploration in advance of our main study. We attempted to include both old and new journals, published in a variety of locations. The *h*-index was selected as the basis of comparison as it is provided on both *SSCI* and *Scopus*, and was able to be easily calculated from data from *Google Scholar* (data from *Google Scholar* were gathered and 'cleaned' as per the process used in our main study, described in the Section 4 below, and the *h*-index was calculated as described above). The ten journals' *h*-index scores from the three databases are listed in Table 4.

Table 4
Comparison of *h*-index scores across citation databases.

Journal title	Country[a]	Year of first issue	*Google Scholar h*-index	*SSCI h*-index	*Scopus h*-index
Jnl. of Accounting & Econ	Netherlands	1979	140	67	70
Jnl. of Accounting Research	USA	1963	132	57	43
Contemporary Accounting Research	Canada	1984	70	12	25
Jnl. of Bus. Finance & Accounting	UK	1974	46	7	10
European Accounting Review	UK/Belgium	1992	31	3	3
British Accounting Review	UK	1968	31	[b]	12
Abacus	Australia	1964	29	6	4
Financial Accountability & Mgmt	UK	1985	27	[b]	[b]
Intl. Jnl. of Accounting	UK	1965	27	[b]	12
Jnl. of Intl. Financ. Mgmt & Acctg.	UK/USA	1988	26	[b]	2

[a] Country is as stated in *Ulrich's Periodical Directory*, 2008.
[b] Not indexed in this source.

As shown in Table 4, four of the ten titles are not indexed in *SSCI*, despite appearing in several business journal rankings (Ballas & Theoharakis, 2003; Beattie & Goodacre, 2006; Comite National de la Recherche Scientific, 2004; Reinstein & Calderon, 2006). Only one title does not appear in *Scopus* (*Financial Accountability and Management*). For the titles indexed in more than one source, *Scopus* produces consistently lower scores (probably due to the limited time coverage discussed in Section 3.2), while *Google Scholar* includes far more citing references than the other sources. Not only is the absolute number of citations higher in *Google Scholar*, but the relative standing of the journals also varies, with *Abacus*, *European Accounting Review (EAR)*, and the *Journal of Business, Finance & Accounting* all achieving different relative *h*-index scores using the *Google Scholar* data.

While our sample was small, our finding that *Google Scholar* produced consistently higher citation results is consistent with Chow, Haddad, Singh, and Wu's (2006) study – one of the few recent accounting studies to explore citation databases. Chow et al. (2006) searched for articles from nine accounting journals that are listed in *SSCI* (including five titles that were not included in our sample and which are published in USA), and found that Google provided higher average citation counts than *SSCI*. Chow et al. (2006) note that the difference between the number of citing references from Google and *SSCI* is likely to be due to the type of sources included, and they mention the high number of working papers in the Google data.

The findings from our simple analysis are also consistent with studies from other disciplines: The strong performance of *Google Scholar* is consistent with Saad's (2006) study of *h*-indices for 55 consumer research scholars, and with Harzing's (2008) experiences (discussed earlier). Pauly and Stergiou (2005) found that *JCR* and *Google Scholar* produced similar results when searching for citations of specific articles in various fields (including economics but no other business disciplines). In their study, only citations from 1989 or earlier yielded higher results on *JCR* than on *Google Scholar*. Gray and Hodkinson (2008) found *JCR* and *Scopus* gave statistically very similar results for ecology and environmental science articles.

In reviewing the strengths and weaknesses of the citation databases, it is important to keep in mind the nature of the accounting discipline. Beattie and Goodacre's (2004) analysis of UK accounting and finance academics found that almost half of all research outputs in 1998–1999 were not published in academic journals. Brown, Jones, and Steele's (2007) study showed a reduction in non-journal outputs by UK accounting and finance academics, but in 2003 and 2004 a third or more of accounting research outputs was still published outside of academic journals. For a professional discipline like accounting it is arguably particularly important to include non-academic sources in any citation analysis as they are often instrumental in influencing policy. This is supported by the criticisms of traditional citation databases for their lack of inclusion of scholarly sources other than journals (Bollen & Sompel, 2008).

The likelihood of more frequent errors in *Google Scholar's* source data needs to be considered when comparing the citation databases. However, it is important to note that Thomson's databases are not error free – both under-reporting of citations, and inclusion of material outside the stated inclusion criteria have been found (Dong, Loh, & Mondry, 2005; Reedijk & Moed, 2008). The automated methods Thomson uses to index material can lead to duplicate entries, and of course errors in the original data can lead to errors in Thomson's databases just as they can in Google (Dong et al., 2005; Klein & Chiang, 2004; Nisonger, 1994; Reedijk & Moed, 2008). Furthermore, there is no reason to suppose that some researchers or journals would be likely to have more erroneous citations than others so this limitation of *Google Scholar* should not create distortions in results when citation scores are compared. In summary, while absolute results may not be 100% reliable, relative rankings based on *Google Scholar* data are likely to still be useful.

Overall, *Google Scholar* is problematic when used to assess citations for authors or articles, but is less problematic when used for journal-level citation analysis. Extra time needs to be applied to downloading and processing data, but *Google Scholar* is likely to provide a more comprehensive source for citation-based journal rankings for the accounting discipline.

4. Method

The *g*-index and *Google Scholar* were selected for use in the current study. Data from *Google Scholar* were used to generate a new ranking of accounting journals based on *g*-index scores. The new ranking was then compared with selected existing rankings of accounting journals, and with the *h*-index.

To generate a list of highly-regarded journal titles for further analysis, the study used a compilation of other ranking studies. The technique of combining diverse ranking studies to produce a composite list has been employed successfully in other business studies (for example, Prather-Kinsey & Rueschhoff, 2004; Reinstein & Calderon, 2006; Rosenstreich & Wooliscroft, 2006). Eight rankings of accounting journals were selected for analysis and they are described briefly in Table 5. The selection of sources was based on finding rating or ranking studies with good coverage of accounting journals. We specifically sought out diverse methodologies, and studies which involved differing types of respondents (for example from different countries or types of institutions). As the purpose of the study was to compare ranking methods, it was also important to identify sources that were published within a similar time period.

The rankings from the eight studies were entered into a database and those that had been in the form of ratings were converted to rankings. As some of the studies were multidisciplinary, titles that were only ranked by those sources needed to be reviewed to reduce the number of non-accounting titles in the list. A title was therefore only retained in our data set if it was ranked by at least three sources. Furthermore, if at least two of the three accounting-specific sources did not rank the title then it was removed unless if it was clearly focussed on accounting content (the three studies that were accounting-specific were Ballas & Theoharakis, 2003; Herron & Hall, 2004; Reinstein & Calderon, 2006). This process generated a list of 34 accounting journals that performed well across the range of ranking and rating studies. A mean ranking was calculated for all titles by averaging the ranks they received in the eight studies.

Citing references to articles from the journals were then gathered from *Google Scholar*. Each journal's current title (and, separately, any previous title(s)) was entered into *Google Scholar*'s advanced search feature to search for all articles from that journal across all date ranges. The results were checked for duplicate entries (misspelled or badly entered data) and duplicate citations combined where appropriate. Overall, the level of duplicates within *Google Scholar* was found to be around 3%. In hindsight, it would have been useful to analyse the types of errors found in *Google Scholar* in more depth, and to track the time taken to process the data, but unfortunately these details were not recorded.

Google Scholar includes a 'Cited by xx' field for each article which notes the total number of citations (xx) it has received. This field was extracted from the cleaned data and exported to Excel. Sorting by the 'Cited by xx' field in descending order creates a table for calculation of *h*-index and *g*-index scores. Formulae were entered into Excel to calculate how many articles in each journal had received less than or equal to the ranked number of 'Cited by xx's, and the highest figure was recorded as the journal's *h*-index. Other formulae calculated the number of articles where the cumulative total of the 'Cited by xx' column, was greater than or equal to the number of articles squared. The largest figure was recorded against the journal as its *g*-index score. This methodology is consistent with the creation of *h*- and *g*-index scores described in other studies (for example, Banks, 2006; Braun, Glänzel, & Schubert, 2006; van Raan, 2006).

The *g*-index and *h*-index data were converted into rankings of the journals. SPSS software was then used to generate Spearman's Rank Order Correlation Coefficients to compare the rankings produced by the published studies, *JCR*, and the rankings based on the *g*- and *h*-index scores.

5. Results

The ranking of the thirty-four titles produced by the *g*-scores is provided in Table 6, along with Impact Factors, *h*-index scores, and the average of the rankings received from the eight sources used to compile the title list.

The list of thirty-four accounting titles that emerged from combining the results from the eight ranking studies reveals the large proportion of top ranked accounting journals that are not indexed in *JCR*, with twenty-seven of the thirty-four titles (79%) not appearing in the 2005 edition of *JCR*, including six journals that were ranked in the top twenty by *g*-index.

The age of the thirty-four journals varies widely, from *The Accounting Review* which commenced publication in 1926 through to several titles that were started in 1992. The mean age of the journals was twenty-nine years, with a median of twenty-four years. A comparison of the age of the journals and the *g*-index rank was carried out. Because our methodology had no date restrictions (in contrast to the Impact Factor), it was important to determine whether the age of the journal might be a significant influence on *g*-index and thus distort the journal ranking. Only a weak (but significant) relationship was found between the age of the journal and the *g*-index score or rank. The relationships between the ages of the journals and rankings were also explored for each of the eight ranking sources used in the analysis and in all cases only a weak relationship was found.

The *Journal of Accounting and Economics* (*JAE*) received a *g*-index of 140 to put it at the top of the new ranking, with the *Journal of Accounting Research* (*JAR*), close behind with a *g*-index of 130. The third highest *g*-index (109) was earned by *Accounting Review* (*AR*). Looking at how these three titles fared in other ranking methodologies, *JAE* received a top ranking in four of the eight studies; ranked 3rd or 4th in three studies; and was not ranked in Beattie and Goodacre (2006). *JAR* which ranked second on *g*-index was ranked top in five studies; 2nd in two and 3rd in the remaining study. *AR* also ranked top in five studies; was ranked 2nd in one study and 5th in Herron and Hall (2004).

The calculated mean ranks for the journals (shown at far right of Table 6) reveal the differences between the eight published ranking studies. *Journal of Accounting Auditing and Finance* and *Behavioral Research in Accounting* both had mean rankings under 10 but ranked 16th and 28th by *g*-index. This is not simply a matter of the *g*-index ranks being out of line with the other sources, as rankings for the two titles varied from 1st to 15th across the eight published studies. The variation across ranking studies was also evident for other titles: *Management Accounting Research* received rankings ranging from 1st to 29th in the published studies to give it an average ranking of 13 and was ranked 10th equal by *g*-index. *The British Accounting Review (BAR)* received rankings ranging from 5th to 74th in the published studies with an average rank of 35 and ranked 18th

Table 5
Rankings of accounting journals used in the current study.

Ranking source	Method
Aston University 2006 (Harzing, 2007)	The accounting titles from the 2006 version of this ranking were used. The list was originally compiled from a large survey of academics in the Midland Universities in the UK. The list was later updated with input from Aston research convenors (Harzing 2007).
Ballas and Theoharakis (2003)	An online survey of international accounting academics (1230 usable responses – a response rate of 20.6%). Respondents identified up to 10 top tier journals based on their perceived contribution to the accounting discipline, and were also asked to add up to 10 additional journal titles. A menu of 58 titles was provided and respondents could also type in additional titles. The full sample ranking was used in the current study.
Beattie and Goodacre (2006)	A summary ranking based on submissions to the UK 2001 Research Assessment Exercise (RAE).
Comite National de la Recherche Scientific (CNRS) (2004)	[French National Committee for Scientific Research - Economics and Management] The ranks were assigned by the Committee in consultation with French and overseas 'experts' on the basis of criteria such as reputation, audience and impact.
Harvey-Morris Business Journals Listing 2006 (HMB) (Harzing, 2007).	The Bristol Business School created a ranked list in 2004 and then gained feedback from UK business school Deans and Research Directors in the UK.
Herron and Hall (2004)	A survey of accounting academics within AACSB accredited colleges in the USA. Usable responses were received from 616 participants (a response rate of 17%). Respondents ranked a list of 40 journals for 1 or 2 areas of scholarship. The overall top twenty journals were used for the current study.
JCR 2005 Social Sciences Edition (Thomson Scientific, 2008a)	Rankings (based on impact factors) of accounting journals listed in the *JCR* database.
Reinstein and Calderon (2006)	A compilation of 19 journal rankings that were used within faculties for promotion, tenure, merit and other purposes.

equal on *g*-index. *The Journal of Accounting Auditing and Finance* received rankings ranging from 1st equal to 15th in the studies, giving an average of 8, and was ranked 16th on *g*-index.

The *g*-index scores showed significant correlations ($0.000 \leq p \leq 0.023$) with all the published ranking studies, however the relationships were not all equally strong ($0.495 \leq \rho \leq 0.929$), and, in some cases, involved small numbers of journals in common (n ranged from 0.2 to 34). Correlations amongst the seven published ranking studies varied as would be expected due to their differing methodologies. Reinstein and Calderon (2006) showed the greatest agreement with other rankings with five significant correlations, though the correlations were weak with the Aston ($\rho = 0.572$; $p = 0.001$; $n = 29$) and HMB ($\rho = 0.424$; $p = 0.031$; $n = 26$) studies.

The *h*-index produced related, but not identical, rankings to the *g*-index ($\rho = 0.988$; $p = 0.00$; $n = 34$). While the two rankings were strongly correlated, rankings produced by the *h*-index differed from *g*-index ranks for several journals, indicating that those titles included some highly cited articles that were disregarded by the *h*-index calculation. For example, *EAR* and *BAR* received the same *g*-index scores to rank 18th, but when ranked by *h*-index, *EAR* moved up slightly to rank 16th, while *BAR* scored a lower *h*-index and moved down to a rank of 20th.

While significant correlations exist between all of the ranking methods and *g*-index scores, the correlation statistics do not tell the full story. The *g*-index clearly ranks some journals rather differently than the other ranking methods and it is those 'outliers' that are of particular interest. The Aston University and HBM ratings produced many results that are not consistent with the *g*-index rankings, with titles that received the best ratings from these published studies having a wide range of *g*-index ranks. This suggests that these opinion-based ratings are not as discriminating as a *g*-index-based ranking, and also that they bear little relationship to whether a journal is highly cited.

The CNRS (2004) 'expert' ranking, and Ballas and Theoharakis's (2003) online survey both correlated relatively strongly with the *g*-index ranks ($\rho = 0.727$ & 0.828; $p = 0.000$; $n = 20$ & 31). However, on reviewing the data it was found that, while the very top ranked journals scored well in both rankings, rankings across the rest of the range of journals varied to a great degree. For example, *BAR* and *EAR* had ranked 74th and 78th in the CNRS list, but ranked 18th equal by *g*-index. Similarly, *Management Accounting Research* and the *National Tax Journal* ranked 24th and 28th in Ballas and Theoharakis (2003) but were in the top ten journals by *g*-index.

Herron and Hall's (2004) survey results included only seven accounting titles that were retained in the analysis. Despite the small number of titles it is clear that some highly cited journals were ranked quite poorly, for example, *Accounting, Organizations and Society* had a high *g*-index (86) and ranked 5th in this study, but was only ranked 15th out of 20 journals in Herron and Hall's (2004) results. There were also only seven accounting titles indexed in *JCR*, however, even with such a small sample, it is evident that the rankings based on Impact Factor do not line up with *g*-index. The most notable departure is *Auditing: a Journal of Practice and Theory* which is listed in *JCR* but in our analysis ranked below five journals that were not indexed in *JCR*.

6. Discussion

This study employed *Google Scholar* as the data source for the calculation of *g*-index scores for accounting journals. The source provides the advantages of free access and broad coverage (both in terms of titles and date coverage).

Table 6
Accounting journals listed by *g*-index rank.

Rank	Journal title	Country[a]	ISSN	Start year	*g*-Index	*h*-Index	Impact factor[b]	Mean rank[c]
1	Jnl of Acctg & Economics (JAE)	Netherld	0165-4101	1979	140	88	1.88	3
2	Jnl of Acctg Research (JAR)	USA	0021-8456	1963	132	83	1.64	2
3	Acctg Review (AR)	USA	0001-4826	1926	109	70	1.69	3
4	Acctg, Orgtns. & Society (AOS)	UK	0361-3682	1976	86	59	0.87	9
5	Contemp, Acctg Research (CAR)	Canada	0823-9150	1984	70	36	0.76	12
6	National Tax Jnl	USA	0028-0283	1916	63	42	0.84	24
7	Acctg Horizons	USA	0888-7993	1987	54	33		19
8	Management Acctg Research	UK	1044-5005	1983	49	33		13
9	Jnl of Business Finc. & Acctg.	UK	0306-686x	1974	46	35		18
10	Acctg Auditg. & Acctblty Jnl	UK	1368-0668	1987	44	28		17
10	Jnl of Mgmt Acctg Research	USA	1049-2127	1989	44	28		10
12	Auditing: A Jnl of Practice &…	USA	0278-0380	1981	43	30	0.56	20
13	Acctg & Business Research	UK	0001-4788	1970	40	29		13
14	Jnl of Acctg & Public Policy	USA	0278-4254	1982	37	26		12
14	Jnl of Acctg Literature	USA	0737-4607	1982	37	24		11
16	Critical Perspectives on Acctg.	UK	1045-2354	1990	32	25		20
16	Jnl of Acctg Auditing & Finance	USA	0148-558X	1977	32	24		8
18	European Acctg Review (EAR)	UK/Belg.	0963-8180	1992	31	24		35
18	British Acctg Review (BAR)	UK	0890-8389	1968	31	20		35
20	Abacus	Austral.	0001-3072	1964	29	18		16
21	Financial Acctblty & Mgmt	UK	0267-4424	1985	27	20		43
21	International Jnl of Acctg	UK	1094-4060	1965	27	20		18
21	Issues in Acctg Education	USA	0739-3172	1983	27	22		28
24	Acctg and Finance	Austral.	0810-5391	1960	24	19		39
25	Jnl of Acctg Education	USA	0748-5751	1982	22	16		19
26	Jnl of the Amer. Tax Assoc.	USA	0198-9073	1979	20	15		10
27	Acctg Educ.: An Intl. Jnl	UK	0963-9284	1992	19	14		56
28	Behav. Research in Acctg	USA	1050-4753	1989	18	15		9
29	Managerial Auditing Jnl	UK	0268-6902	1986	15	13		56
30	Jnl of Intl. Acct, Auditing…	UK	1061-9518	1992	14	9		31
31	Acctg Historians Jnl	USA	0148-4184	1974	13	10		28
32	Advances in Acctg	USA	0882-6110	1984	11	9		31
32	Advances in Intl. Acctg	USA	0897-3660	1987	11	7		35
34	Jnl of Applied Acctg Research	UK	0967-5426	1992	3	3		54

[a] Country is as stated in *Ulrich's Periodical Directory*, 2008 – editorial offices may be located elsewhere.
[b] From the 2005 edition of *JCR*.
[c] Mean Rank is the calculated mean of the ranks assigned to the title in the eight published ranking sources used in the study.

Many of the journals showed that they can be awarded high ranks regardless of the methodology employed to rank them – this is surely the sign of a journal that deserves to be considered a high quality. However, other journals showed significant variation in rankings across the eight rankings sources and the new *g*-index ranking. As five of the eight sources were opinion-based surveys, it suggests that the status of journals other than the very top ranked titles can depend on who is being surveyed, when and how.

This poor coverage of accounting's journals certainly limits the usefulness of *SSCI* or its derivative, *JCR*, as a basis for journal ranking. The relatively strong performance of some journals that are not in *JCR*, suggests that the selection policies for the database are somewhat out of line with citation patterns of accounting journals. For the journals that were indexed in *JCR*, the differences in the rankings in our study are likely to be at least partly a result of citations from a broader range of academic sources indexed in *Google Scholar* as compared with *JCR*. It is appropriate that journal rankings should take account of use of research across a broad range of academic sources. In business disciplines in particular some academic publications are more practitioner-focussed than others and these may therefore be cited more broadly.

However, the lack of transparency in what data are added and how they are added to *Google Scholar* is of concern, and the lack of quality control can lead multiple entries can distort results, unless the data are cleaned as in this study. If researchers are aware of the limitations and therefore use the *Google Scholar* data appropriately, these weaknesses can be minimised. Journal *g*-index scores can of course also be generated from citation data sourced elsewhere and it is likely that over time, better quality sources will become available.

The relationship between the age of the journal and the *g*-index was not found to be strong, but the age of a journal will clearly have more effect on the *g*-index than on Impact Factors because of the inclusion of data on more than just the previous two years' articles. Generally earlier established journals are regarded as having more status in most disciplines and it is perhaps appropriate that those journals that survive over decades should been be seen in that way. Keeping in mind that the *g*-index is a measure of highly cited articles, any advantage older journals may have is not based on their age per se but on use of their content, which seems warranted. In contrast, in an opinion survey an older journal could have a good reputation regardless of how well cited its content was, and with the Impact Factor only a short-term snapshot is obtained. If the time factor is of concern, the *g*-index can be calculated for any date range to obtain a current rather than overall standing of the journal.

The use of *g*-index scores to rank journals permits comparison between journals in a quantifiable, consistent, and replicable manner. However, it is important to recognise that the culture of individual journals (for example, in terms of how many references are included in articles) may impact on citation and thus the journal's *g*-index, and similarly, the cultures of disciplines (and sub-areas of disciplines) also vary, so comparisons are not clear cut. The *g*-index does have the advantage that the degree of difference between journals is measurable and not based on perceptual rankings. Furthermore, the *g*-index is based on the articles in the journal, not the reputation of the journal (though of course reputation may impact on whether journals are cited or not and therefore have an indirect effect on *g*-index results).

Employing the *g*-index to rank journals is a significant innovation which moves citation analysis beyond the poor coverage of accounting journals in Thomson's citation databases, and the time-constrained Impact Factor formula. However, it does not resolve the basic problem of construct validity when citation counts are used to assess quality, or even use of articles or journals. It should be clear that citations do not reflect all use of research, and that citation is not synonymous with quality. Citation analysis is merely a convenient measure for a complex construct.

7. Conclusions

This study has reviewed some of the techniques and data sources that can be used to assess the impact of research. The *g*-index has been applied to journals from the accounting discipline for the first time and appears to provide a useful score for use in ranking journals. Data for the *g*-index calculations were sourced from *Google Scholar* due to its convenience, low cost, and broader coverage of business sources.

In an ideal world, academic performance would be assessed based on expert review of the merit of individual research. In practice, evaluation is aided by an understanding of the relative standing of the journals in which research is published. Citation-based rankings of journals are recognised as providing both a consistent and practical means of assessing research impact. However, traditional approaches to citation-based rankings of journals, such as the use of journal Impact Factors, have limitations. The results of the study show that some accounting journals that perform well in opinion surveys or Impact Factor rankings are not necessarily highly cited. Recent developments in citation analysis provide academics with more choices of data sources and methods for citation analysis.

The *g*-index reflects the impact of a journal, and it allows a few highly cited articles to influence, but not dominate, the index score for the journal overall. The *g*-index values for journals are not difficult to calculate, particularly when compared to the effort involved in conducting an opinion survey. A perfect measure of journal impact is unlikely to ever exist, however *g*-index scores represent an improvement on current alternatives.

As this was the first time the *g*-index has been used to rank journals in this way, the study suggests several areas for further research. As the major criticism of *Google Scholar* is its data quality it would be useful to track errors and duplicate entries in detail to provide clearer guidance to other researchers. It would also be valuable to repeat the study, but to gather citation data from within a restricted date range on *Google Scholar* to explore how this affects rankings. However, this type of study would require an appropriate date range to be determined and that necessitates careful analysis of citation patterns within the accounting discipline. Finally, it may be valuable to combine *g*-index data for journals with a robust and up-to-date opinion survey to create a ranking that captures both a quantitative assessment of journal impact, and stakeholders' perceptions of quality.

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