

REVERSE MORTGAGES: A BIBLIOMETRIC APPROACH

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(Received 25th May 2022; accepted 9th July 2022)

Abstract. The present study performed a bibliometric analysis using 119 articles in the field of reverse mortgages from the Web of Sciences (WoS) database from 1978 to May 2022. To provide a comprehensive result, this study employs VOS Viewer software to construct the networks of co-citations of authors and sources of articles. The results show that the growth trend was recognized from the beginning year 2011 and it gained significant attention from researchers before and during the predicament period of the Global financial crisis 2007-8. It can be seen that the positive trend of interest in this field of study remained in the following years, particularly in the years 2020 and 2021. Using the co-citation analysis, the authors focus on fundamental issues in reverse mortgages such as knowledge (literacy) and demands of reverse mortgage products for elderly homeowners, risks associated with reverse mortgages such as default on their property taxes and insurance, potential growth of reverse mortgages as a financial tool, and fair valuations of reverse mortgages. The Journal of the American Real Estate and Urban Economics Association and Insurance Mathematics and Economics are found to be the most-cited journals in the field of study of reverse mortgages.

Keywords: reverse mortgages, bibliometric analysis, co-citation, VOSViewer

Introduction

The reverse mortgages program allows older homeowners to unlock and consume a portion of their home equity without leaving their properties (Boj et al., 2022; Fong et al., 2020). With reverse mortgages, the older homeowners may borrow from the lenders using their properties as collateral. The borrowers may choose to take the funds either as fixed monthly instalments in the form of pensions, line of credit, or lump sums (Han et al., 2017). Hence, reverse mortgages have been an important financial tool for cash-poor seniors to release home equity (Shi and Lee, 2021). Evidence in the pieces work of pieces of literature has documented evidence of underdeveloped reverse mortgage markets in several countries, particularly in Australia, Italy, Netherland, Singapore and the US (Davidoff et al., 2017; Dillingh et al., 2017; Jefferson et al., 2017; Fornero et al., 2016; Phang, 2015) due to several reasons such as poor product growth and high transaction costs (Mitchell and Piggott, 2004), precautionary saving patterns (Nakajima and Telyukova, 2017) and fluctuate house prices (Chen and Yang, 2020).

Though the definition of the reverse mortgage is considerably specific, the scope of research in this field has remained broad and of increasing importance. Hence, there is a need for systematic conduct of the bibliometric analysis in the piece of literature

regarding reverse mortgages. The present study aims to fill the gap by providing a comprehensive overview and synthesizing the extant research on reverse mortgages. The objectives of this work are as follows: (1) to evaluate the academic impact of the research topic; and (2) to identify the structure of the research topic. To evaluate these issues, the present study applies a bibliometric methodological approach to analyze the research topic by performing the following methods: (1) evaluative techniques to address the academic impact of the research topic, and (2) relational techniques to analyze the relationship between the units of analysis. The findings of the study allow the authors to identify the importance of the topic of reverse mortgages and provide indications to academic scholars on current research in this area. The results of the analysis identify the academic impact of the research topic by measuring the evolution of annual publications, the distribution of articles by the journal as well as the total number of citations per article. Furthermore, the results also highlight the intellectual structure of the topic from the perspectives of the authors that are most frequently cited together, thematic organization according to the journals, and the research trend. The remaining of this article is organized as follows: (1) the second section presents the data collection and bibliometric methodology; (2) the third section demonstrates the analysis of results and finally, (3) the fourth section includes the conclusions, limitations, and future research lines.

Data collection and bibliometric methods

To select the most suitable articles for this study, we conduct a search process. The search process allows the researchers to identify existing studies in the literature, analyze their relevance to our specific research topic, compile appropriate articles that match the research and finally synthesize their implications. The study utilizes the Web of Sciences (WoS) database as our research engine knowing that it is one of the most comprehensive databases in the field of social sciences, in business and economics. The authors include articles from 1978 to the month of May 2022 and the document search was carried out on 2nd June 2022. We use the following basic keywords such as “reverse mortgage” or “reverse mortgages” to retrieve relevant papers. The sample is limited to the articles published in peer-reviewed journals included in the WoS database written in the English language. To ensure the chosen articles meet the field of the study, the authors double-checked the results of our initial search by performing the second screening of literature, resulting in 119 final documents. Details of the protocol are outlined in *Table 1*.

Table 1. Search protocol and results.

Database	Web of Science (WoS)
Documents searched	Topic
Data range	1978 until May 2022
Search date	2 nd June 2022
Search terms	“reverse mortgage” or “reverse mortgages”
Inclusion criteria	Articles
Language	English
The initial number of documents	124
Filter process	Not related to the topics
The final number of documents	119

Following Donthu et al. (2021) the study employs a bibliometric methodological approach by performing both evaluative techniques to measure the publication-related metrics using productivity as a proxy which accounts for the contributions of research constituents; and relational techniques to identify the structure of the research topic based on the relationships between research constituents. Notably, to measure productivity, several analyses are conducted such as the number of articles published yearly, and the distribution of articles by journals. Within the evaluative technique method, the study also performs the citation-related metrics to measure the impact and influence by conducting the citation analysis based on the most cited articles. The relational techniques, on the other hand, emphasize the intellectual interactions and structural connections among research constituents. In this study, the authors employ VOS Viewer software to visualize various networks such as co-citation analysis of authors and sources of journals.

Results and Discussion

Evaluative techniques

As mentioned earlier, the study employed the standard practice of evaluative technique to evaluate the academic impact of reverse mortgages by measuring the productivity and the impact of citation.

Measure of productivity

Figure 1 presents the number of academic articles on reverse mortgages per year. Evidence shows that the researchers begin to explore issues of current interest in reverse mortgages in 1978 and was published in the Journal of Real Estate Taxation, by Robinson. The number of articles, subsequently, gained much attention in the year 1994, with six academic papers published in the Journal of American Real Estate and Urban Economics Association alone, mostly focusing on the risks associated with reverse mortgages. The growth trend was recognized from the beginning year 2011 till to date, in the month of May 2022, with a considerable number of academic articles related to the subject of the study. It gained significant attention from researchers before and during the predicament period of the Global Financial Crisis, noting that in the wake of the financial crisis, rising loan defaults particularly in the US, Europe and Asia countries raised concerns among the academic community to explore the dynamic of reverse mortgage programs. The positive trend of interest in this field of study remained in the following years, particularly in the year 2020 and 2021, with 18% and 12% annual publication on reverse mortgages, respectively. Interestingly, during the outstanding periods, the research area is more inclined to the risks, valuation, policy, and regulations associated with reverse mortgages, including the use of big data and artificial intelligence in reverse mortgages.

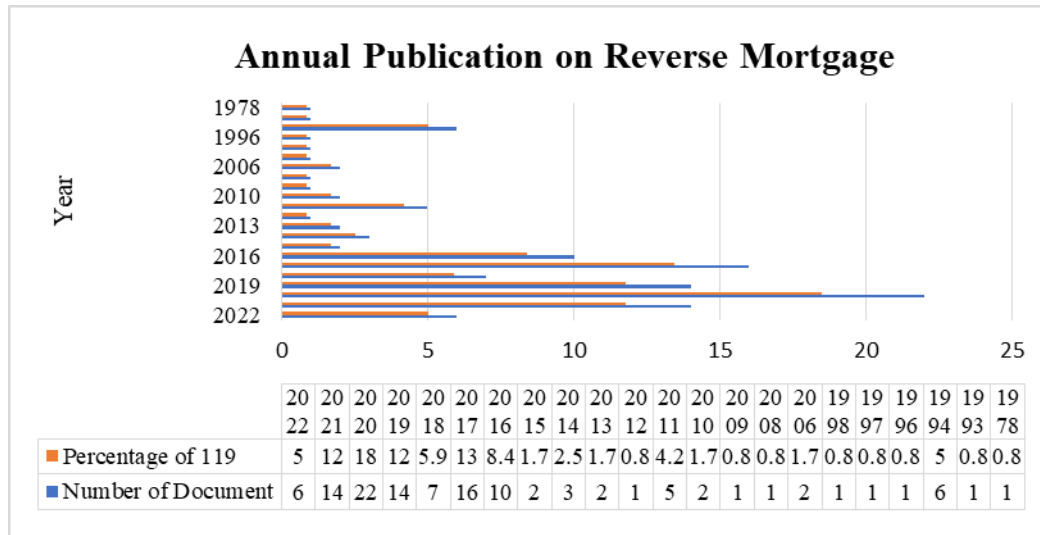


Figure 1. The annual publication on reverse mortgage in the Web of Science (WoS) database.

Table 2 describes the distribution of more than two articles by the journal’s title on the research topic. The Journal of Real Estate Finance and Economics – Q1 in Journal Citation Report (JCR) is remarkably the most productive source on the issue of reverse mortgages with seven academic articles published throughout the years until to date, May 2022. It is worth noting that 60 journals have published more than one article until May 2022, accumulating nearly 50.45% of the total sample. The selected journals are mainly in the following research areas: business economics, urban studies, mathematics public administration, environmental sciences ecology, geriatrics gerontology, mathematical methods in social sciences, operation research management, development studies, government law, engineering, psychology, and science technology. The remaining 59 documents had only been published in one article in the 59 journal publication titles.

Table 2. Distribution of articles by journal.

Publication titles	No. of Document
Journal of Real Estate Finance and Economics	7
Journal of The American Real Estate and Urban Economics Association	6
Cityscape	5
Dynamic Systems and Applications	5
Insurance Mathematics Economics	4
Journal of Housing Economics	4
Real Estate Economics	4
Geneva Papers on Risk and Insurance Issues and Practice	3
Ageing Society	2
Asian Economic Journal	2
Gerontologist	2
Habitat International	2
International Journal of Financial Studies	2
International Review of Economics Finance	2
Journal of Economic Behavior Organization	2
Journal of Housing and the Built Environment	2
Journals of Gerontology Series B Psychological Sciences and Social Sciences	2
Prague Economic Papers	2
Sustainability	2

Measure of impact: Citation analysis

The present research includes a citation analysis to identify the most cited academic papers in the field of reverse mortgages. Table 3 demonstrates the five most cited published articles on reverse mortgages. The concentrations of these articles are mainly in the areas of business economics, urban studies, and mathematics methods in social sciences. Of the five most cited articles, a study by Shan (2011) focuses on the demand for reverse mortgages among elderly homeowners in the US from the year 1989 to 2007 and recorded the highest citations of 49. The authors also find that among the five most cited articles, two articles are published in the Journal of the American Real Estate and Urban Economics Association, in which one of the articles is ranked as the second-highest citation of 47. The said article was published in the year 1994, by Szymanowski (1994) who analyzes the risks involved with reverse mortgage insurance and explained the pricing model developed for the Home Equity Conversion Mortgage (HECM) in the US market. On the other hand, another work in the related urban studies research area, which focuses on an issue related to the risk of default is that the borrower will remain in the house after the negatively amortizing loan balance exceeds the value of the house (Chinloy and Megbolugbe, 1994). The present study also identified that other academic papers address the issue of reverse mortgages from the various perspectives in business and economics, finance, and mathematics in social sciences. Among them, Nakajima and Telyukova (2017) investigate the reverse mortgages in a regulated life-cycle model of retirement, where the study shows that the reverse mortgages loan demand increases threefold for the lowest income and oldest households, indicating that the Great Recession does impact differently across the age, income, and wealth distribution. A study by Shi and Lee (2017) provides empirical relevance to the dynamic spatial panel data model with larger interactive individual and longer time effects to examine the effects of house prices in the US on reverse mortgage origination rates with the presence of spatial spillover effect. The study concludes that the Home Equity Conversion Mortgage (HECM) activity in the US states negatively influenced the developments of neighboring states arising from the spatial spillover effect.

Table 3. Distribution of articles by authors.

Authors	Article title	Source title	Publication year	Cites
Shan, H	Reversing the Trend: The Recent Expansion of the Reverse Mortgage Market	Real Estate Economics	2011	49
Szymanowski, EJ	Risk and the Home Equity Conversion Mortgage	Journal of the American Real Estate and Urban Economics Association	1994	47
Nakajima, M; Telyukova, IA	Reverse Mortgage Loans: A Quantitative Analysis	Journal of Finance	2017	40
Chinloy, P; Megbolugbe, IF	Reverse Mortgages - Contracting and Crossover Risk	Journal of the American Real Estate and Urban Economics Association	1994	39
Shi, W; Lee,	Spatial Dynamic Panel Data	Journal of	2017	39

LF	Models with Interactive Fixed Effects	Econometrics
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Relational techniques

Earlier, the authors had indicated that the techniques for science mapping which includes co-citation analysis, co-word analysis, citation analysis, bibliographic coupling and co-authorship analysis; when combined with network analysis are influential in describing the bibliometric structure and the intellectual structure of the research field (Baker et al., 2020). In this study, we employ the co-citation analysis.

Co-citation analysis

Co-citation analysis is a method used for science mapping with the assumption that the publications are cited together when they co-occur in the reference list of another publication. The authors utilize both authors' co-citation analysis and journal co-citation analysis in the present study. The former approach is conducted to identify which authors are the most frequently cited together, while the latter method is employed to recognize which sources are cited the most in the reverse mortgages.

Figure 2 depicts the co-citation analysis using the VOS Viewer software in the subject of study, reverse mortgages. Evidence indicates that there is a total of 1995 cited authors in the 119 academic articles analyzed, of which 18 authors met the threshold of a minimum of 20 citations per author. Fundamentally, each node represents an author, and the size of each node describes the number of times the author has been referenced in the 119 academic articles selected in the present study. Each author is connected to another, and a link between the two nodes illustrates the co-citation relationship. Each link has its strengths, and the thickness of the link indicates the level of strengths. Specifically, the thicker the link the higher the strength of the co-citation relationship. In addition to that, the nodes are classified by their similarities. *Figure 2* demonstrates that there are three groups identified in the field of study of reverse mortgages. The green cluster consists of six authors, concentrating their research area on business and economies, urban studies, and psychological sciences. These studies focus on fundamental issues in reverse mortgages such as knowledge (literacy) and demands of reverse mortgage products for elderly homeowners, risks associated with reverse mortgages such as default on their property taxes and insurance, potential growth of reverse mortgages as a financial tool, and fair valuations of reverse mortgages. Interestingly, the first three authors from this cluster, namely, Davidoff, T., (74 citations and 391 total link strength); Szymanowski, EJ (43 citations and 249 total link strength) and Nakajima, M. (36 citations and 215 total link strength) are the most frequently cited together.

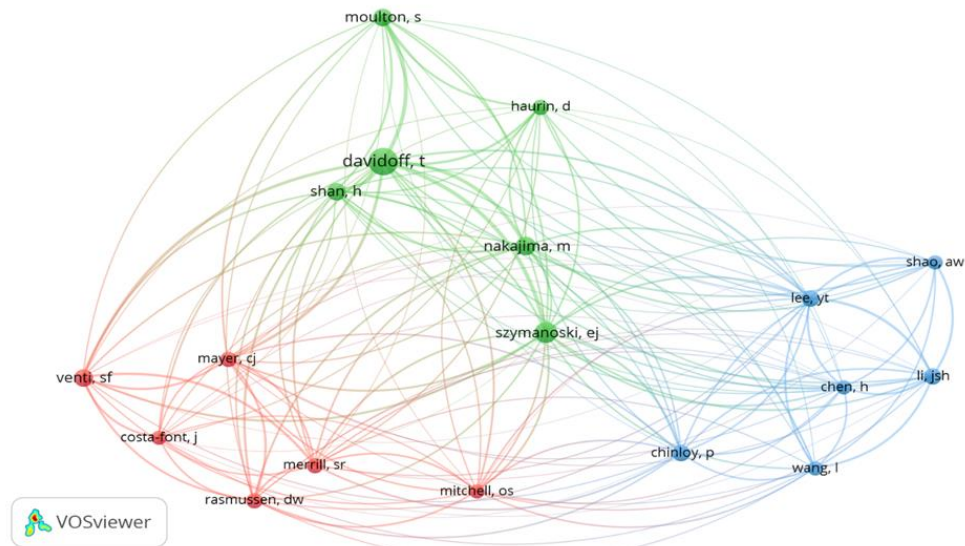


Figure 2. Co-citation network of authors of reverse mortgages.

The red cluster encompasses six authors focusing on the following research areas of business and economics, public administration, geriatrics and gerontology, urban studies, and environmental sciences and ecology. Similar to the evidence shown in the green cluster, two authors are listed under the top ten most frequently cited together as in the following: Venti SF (33 citations and 173 total link strength); and Merrill, SR (25 citations and 162 total link strength). The studies are closely related to the green cluster, whereby the authors are concentrating on issues about the potential demand for reverse mortgages among elderly women householders; the potential size of the market for unrestricted reverse mortgages; the potential of reverse mortgages to increase the income and liquidity wealth of the elderly and including the individual's expectations of having to use their house wealth whether it depends on income or housing assets or by the socio-environmental housing characteristics. The blue cluster comprises six authors who predominantly demonstrate less frequently cited together relative to those authors in the other two clusters, except for two authors. Remarkably, studies in this cluster are closely connected to the green cluster, whereby the authors are concentrating on risks associated with reverse mortgages such as the risk of default whereby the borrower will remain in the house even after the negatively amortizing loan balance exceeds the value of the house; risks of the reverse mortgage in two prominent market arrangements with the presence and absence of external insurers and including the impact of early surrender on the entire risk profile of reverse mortgages.

Academically, the co-citation analysis is a science mapping method for academic researchers to discover the seminal publications and knowledge foundations in a research field. Using the journal co-citation approach, the authors can analyze the most influential journal titles in reverse mortgages. Profoundly, the academic scholars accept the notion that the greater the frequency of citations for the two sources together, the greater the similarities between the journal along with its research areas. *Figure 3* presents the co-citation network of sources of reverse mortgages using the 119 academic articles. To conduct this analysis, a sample of 119 articles is analyzed using the VOS Viewer, resulting in a total of 1170 sources being identified, of which 9 met the threshold of a minimum of 48 citations of a source. From *Figure 3*, it can be observed

that there are nine nodes, representing the journal titles, and the node size indicates the number of citations received. It is highlighted that the distance between the journal titles shows the relatedness of the journals from the perspective of co-citation links. Particularly, the strength of the co-citation link between journal titles is represented by the thickness of the lines. Intriguingly, it is found that the Journal of the American Real Estate and Urban Economics Association is the most-cited journal (133 citations and 886 total link strength). The result is as expected, given the fact that the journal is the oldest academic journal focusing on real estate issues and it is widely known as the premier journal for real estate-related topics.

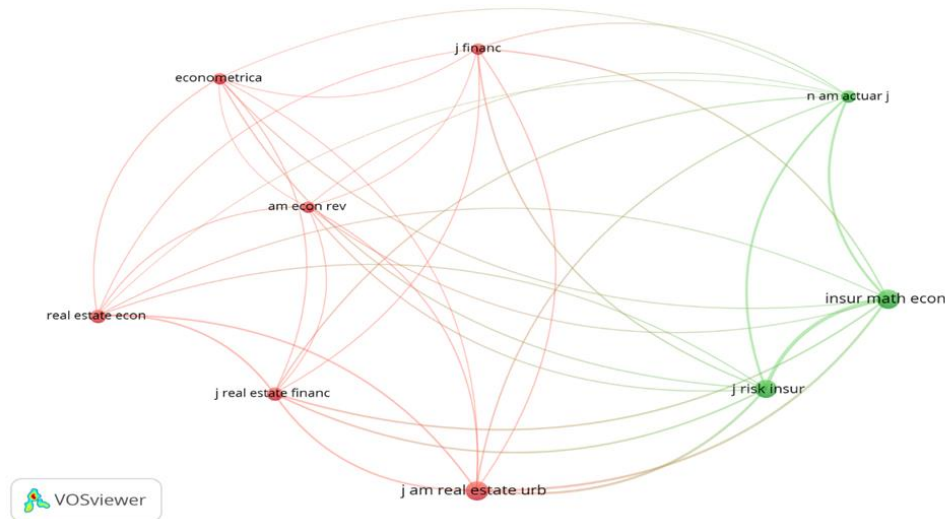


Figure 3. Co-citation network of sources of reverse mortgages.

The Insurance Mathematics and Economics is placed the second most-cited (127 citations and 1218 total link strength). The journal published high-quality articles concerning either the theory of insurance mathematics or quantitative insurance economics and their applications. About that, evidence also pointed out that the journal-title Journal of Risk and Insurance is ranked the third most-cited journal citations and 1263 total link strength), followed by the Real Estate Economics (70 citations and 559 total link strength). Like the author’s co-citation analysis, the VOS Viewer software allows the researchers to group the nodes based on similarity. There are two clusters, namely the red and the green. The red cluster consists of six sources, focusing on business and economics, urban studies and public administration research areas. Remarkably, it includes the top five most-cited journal titles: Journal of American Real Estate and Urban Economics Association and Real Estate Economics. Others under the same cluster include the following such as Journal of Real Estate Finance (69 citations and 655 total link strength); Econometrica (53 citations, 469 total link strength); Journal of Finance (48 citations and 428 total link strength) and American Economic Review (47 citations and 351 total link strength). The green cluster, on the other hand, comprises three sources, concentrating on issues related to risks associated with reverse mortgages and their management. Notably, it contains two journals which were placed in the top three most-cited journal co-citations, namely Journal of Risk and Insurance and Insurance Mathematics and Economics. The North American Actuarial Journal (59 citations and 622 total link strength) is another journal title which belongs under the green cluster.

Conclusion

The present study provides an overview and synthesis of pieces of evidence in the literature on reverse mortgages to complement a limited number of review articles in this study. To identify the main studies and research articles on reverse mortgages, the authors assess the academic impact. The notion of reverse mortgages gains interest among academicians in the year 1994, notably six academic articles were published in the Journal of American Real Estate and Urban Economics Association and the growth trend was distinguished from the beginning year 2011 until to date, the month of May 2022. The study identifies that the Journal of Real Estate Finance and Economics – Q1 in Journal Citation Report (JCR) is the most productive source on the issue of reverse mortgages with seven academic articles published throughout the years until to date, May of 2022. Out of 119 academic articles, 60 journals have published more than one article, amounting to nearly 50.45%. In addition, the work of Shan (2011), which focuses on the demand for reverse mortgages among elderly homeowners is found to be the most prominent article in this field of study. Despite that this article was published in 2011 when the research topic has not reached its peak, it has been proven thus far that the study conducted by Shan is the most cited article in reverse mortgages, resulting in 49 citations. The authors also find that among the five most cited articles, two articles are published in the Journal of the American Real Estate and Urban Economics Association, in which one of the articles is ranked as the second-highest citation of 47. To address the patterns in the field of reverse mortgages, the present study determines the structure of the research area by looking at the co-citation analysis based on the authors and sources of reverse mortgages.

Interestingly the following authors: Davidoff, T., (74 citations and 391 total link strength); Szymanowski, EJ (43 citations and 249 total link strength) and Nakajima, M. (36 citations and 215 total link strength) are the most frequently cited together. The authors focus on fundamental issues in reverse mortgages such as knowledge (literacy) and demands of reverse mortgage products for elderly homeowners, risks associated with reverse mortgages such as default on their property taxes and insurance, potential growth of reverse mortgages as a financial tool, and fair valuations of reverse mortgages. The findings are sitting alongside the thematic organization of the research area by the frequency of citations from the two sources together. Evidence shows that the Journal of American Real Estate and Urban Economics Association is the most-cited journal (133 citations and 886 total link strength) followed by the Insurance Mathematics and Economics (127 citations and 1218 total link strength). The study has its limitations. First, the authors only utilized the WoS database, which in some cases, the database sometimes includes articles without keywords, which might reduce the number of articles included in the sample. Second, the reduction of the number of articles included in the sample limits the researcher to interpret the findings and prevents other analyses such as the co-citation of documents. It is suggested that the researchers may perform other science mappings such as co-word analysis, citation analysis, bibliographic coupling, and co-authorship analysis to provide comprehensive discussion in future studies.

Acknowledgement

This research is self-funded. The authors would like to thank Prof. Ainin Sulaiman, International University-Malaya Wales for her valuable insight during the training on bibliometric analysis.

Conflict of interest

The authors confirm that there is no conflict of interest involved with any parties in this research.

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