

Bibliometric Analysis of Real Estate Investment Trusts Research

Xiaoli Wang, Chuan Chen*

xlw140140@163.com, * Corresponding author: chenchuan@scu.edu.cn

Business school, Sichuan University, Chengdu, Sichuan, People's Republic of China

Abstract—In order to understand the research trend and key fields of Real Estate Investment Trusts (REITs), a bibliometric analysis was conducted based on the Web of Science database and Bibliometrix. This study gives a comprehensive overview of the Real Estate Investment Trusts research according to annual output, publishing journals, institutions, authors, research fields and temporal trends in keywords. *The Journal of Real Estate Finance and Economics* and *Real Estate Economics* are the most popular journals for researchers to publish research results. These two journals also have greater influence in this field and have more citations than other journals. State University System Of Florida is the institution with the most research achievements. Seen from the number of papers, C. F. Sirmans, Chinmoy Ghosh and Ong Seow Eng are the most competitive authors. Keyword analysis shows that "risk" and "return" are the most frequently studied topics by researchers. Through literature review, a REITs process model was established to help researchers understand and analyze the target process in depth while grasping the research progress of REITs.

Keywords-Bibliometric analysis; REITs; Data analysis; Research trends

1. Introduction

Real Estate Investment Trusts, or REITs, were born in the United States in the 1960s. The National Association of Real Estate Investment Trusts (NAREIT) defined REITs as a company or commercial trust institution that pooled investors' funds to invest in real estate or provide financing for real estate enterprises. REITs have the characteristics of funds. By pooling the funds of small and medium-sized investors, it lowers the threshold of real estate profits and has a strong appeal to investors, so it has a broad application market. In 2005, Yuexiu Property successfully issued Yuexiu REITs on the Hong Kong stock market, becoming the first REITs in China. REITs have played an important role in promoting the financing and development of real estate. On the macro level, REITs have contributed to the country's economic stability, the protection of government interests, and industry norms to varying degrees. REITs are financial products, and their own characteristics promote their vigorous development, dissemination and application in the world. On the academic level, since the 1980s, the rise of REITs has gradually attracted the attention of foreign scholars, and relevant research achievements have emerged in large numbers. Consistent with the formation and development process of REITs, the focus of scholars' attention is also changing, from focusing on the financing mode and investment income of REITs to how to identify and control the risks brought by REITs, as well as conducting all-round effective management [1]. However, in this hot application and re-

search, scholars lack systematic and macroscopic cognition about the problems and fields involved in REITs research. In addition, they also lack understanding about the development process of application and research over the past half century, as well as future research trends. This paper gives an overview of this research field through data sorting and bibliometric methods, and use IDEF0 model to sort out the REITs process, so as to help scholars better understand the whole life cycle of REITs.

Bibliometrics is an interdisciplinary science that quantitatively analyzes knowledge through mathematical and statistical methods. It is a modern technology integrating computer engineering, database management and statistics. It has been used in various evaluation and analysis work by virtue of its comprehensive knowledge system of quantitative analysis [2]. There are many bibliometric tools, including CiteSpace, VOSviewer and Bibliometrix. These tools basically have the functions of quantity statistics, co-citation analysis, word frequency analysis, and visualization. Mastering bibliometric methods is of great benefit to promoting research. First, bibliometric analysis can help new researchers comprehensively understand and grasp a new scientific research field. Many published journals will use it to explore the publishing structure and citation to show the development of journals [3]. Scholars in the field will analyze the development of the discipline [4], research hotspots and trends [5], and learn about high-quality research institutions and other information.

The purpose of this paper is to evaluate and analyze the current research situation in the field of REITs and explore its development trend based on the literature data retrieved from Web of Science, using bibliometric analysis methods and content analysis methods. There are two innovative points in this study: First, the structure and dynamics of REITs research are fully explored from different perspectives through descriptive statistical analysis and content interaction analysis; Secondly, establish REITs process model based on the concept of infrastructure public offering REITs through literature review and IDEF0 language. The second section of this paper mainly introduces REITs literature collection, Bibliometrix software, and IDEF0 language; The third section mainly makes full use of the functions of Bibliometrix to analyze the literature from simple descriptive analysis to co-citation analysis and factor analysis. On the basis of literature review, the REITs process model is established by using IDEF0 language; The fourth section summarizes the analysis results, and puts forward some thoughts on the future development.

2. Materials and Method

In order to simplify the process from data collection to data visualization, developers Massimo Aria and Corrado Cuccuullo created Bibliometrix, a convenient and efficient bibliometric analysis tool with the help of Shiny tool in R language. It is very flexible and can be quickly updated and integrated according to other R language programs. Therefore, it is very useful in facing the changing theme of scientific research [6]. The literature data used was downloaded from the core collection of Web of Science. 1364 search results can be obtained by entering the subject word "REITs" or "Real Estate Investment Trust". Through preliminary browsing, 1242 search results can be obtained by filtering out the word frequencies of medical related institutions such as "REITs, D.". In consideration of the development of REITs in the academic field, no additional years have been set for the retrieval, except for irrelevant field literature.

The years of literature in the search results range from 1960 to 2022. Export a text file in the format of "full records and cited references". The downloaded file contents include title, publication date, keywords, journal information, author, subject category and so on.

IDEF0 language is a structured and graphical expression to describe the various elements in a complex system and the relationship between them. IDEF0 model consists of a series of figures, arrows and words. It describes complex activities step by step. In this model, boxes are used to represent the activities to be described, and arrows are used to represent the information related to the activities. The general composition of IDEF0 model is shown in figure 1 [7]:

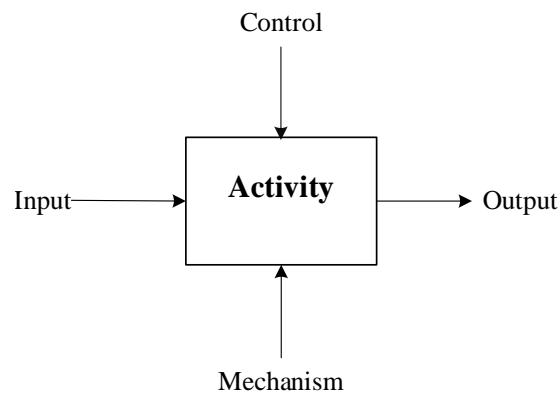


Fig. 1. IDEF0 Model Composition

3. Results & Discussion

3.1 Temporal evolution of outputs

Figure 2 shows the annual literature output of REITs from 1960 to 2022 (the deadline for literature retrieval is June 28, 2022). Since the advent of REITs in the 1960s, some scholars have paid attention to relevant issues and carried out research. However, the number of documents released into the WOS database began to grow rapidly until the beginning of the 21st century. The annual number of documents issued from 2010 to 2016 was about 50. With the spread and application of REITs in the world, the number of published papers has doubled in the past five years, and reached 106 in 2021. This growth rate reflects the increasing attention paid to REITs in recent years, and the related research results are increasingly recognized by academic publications.

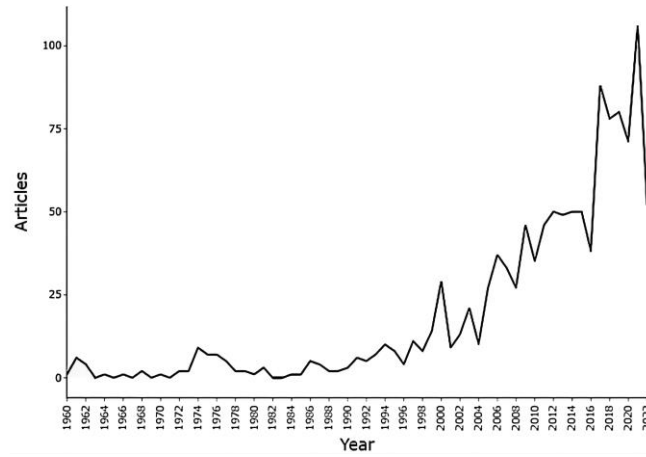


Fig. 2. Annual Document Quantity

Table 1 lists the top 5 countries, institutions and authors who published literature related REITs in the past 60 years. The number of articles issued by the United States ranked first, with 1044. As early as 1960, the United States passed the Real Estate Investment Trust Act, marking the formal establishment of REITs in the United States. Then in the United States, the appearance of "Mortgage Trusts" in the late 1960s, the promulgation of the Tax Reform Act of 1986, and the constantly revised and improved legal framework and product structure successively promoted the rapid development of REITs in the United States [1], which also provided mature market conditions for the academic achievements of REITs. REITs entered the Hong Kong market of China in 2005. Until 2020, based on Chinese national conditions and market, REITs were launched for public offering of infrastructure, which broke down barriers to development and accelerated the process of REITs in China. State University System Of Florida has made a lot of research support work in the related research of REITs, with 98 papers. C. F. Sirmans and Chinmoy Ghosh are the people who put forward the most research results in this field. They have made a deep excavation of the structure and characteristics of REITs, and put forward many meaningful conclusions and findings, including real estate investment trust funds with historically high market account rates have always had consistently high leverage [8], the impact of different board appointment systems on the performance of REITs [9], and the relationship between the acquirer's external and internal corporate governance mechanisms and abnormal returns [10].

Table 1 Top 5 countries, institutions and authors on REITs research

Country	Articles	Institution	Articles	Author	Articles
USA	1044	State University System of Florida	98	C. F. Sirmans	33
China	257	University of Connecticut	50	Chinmoy Ghosh	24
UK	110	National University of Singapore	48	Ong, Seow Eng	22
Australia	104	University of Texas System	36	William G. Hardin III	19
Canada	98	University System of Georgia	36	David C. Ling	18

3.2 Marked journals

Table 2 lists the top 5 journals in terms of the number of REITs published and the top 5 publishing journals in terms of influence respectively. The analysis results of Bibliometrix give the H index, G index and the total amount of citations (TC). The expressions of these indicators are relatively intuitive, and weigh the quality and quantity of articles published by the evaluation object. This statistical table can help readers intuitively see that the top number of papers and influence of the journals that pay more attention to REITs in the field. *The Journal of Real Estate Finance and Economics*, *Real Estate Economics*, and *Journal of Real Estate Research* rank in the top three, which can also help researchers in the field of REITs to contribute and retrieve high-quality academic articles.

Table 2 Top 5 journals in the number of papers/influence

Journal	Articles	Journal	h_index	g_index	TC
The Journal of Real Estate Finance and Economics	237	The Journal of Real Estate Finance and Economics	34	51	4236
Real Estate Economics	120	Real Estate Economics	33	49	2982
Journal of Real Estate Research	61	Journal of Real Estate Research	14	19	580
Journal of Property Investment & Finance	52	Journal of Portfolio Management	8	11	161
Forbes	47	Journal of Property Investment & Finance	7	9	158

3.3 Literature citation

The citation index of articles is often used to evaluate the quality or influence of scientific research. The citation is a sign that a paper is recognized by others, and a manifestation that other researchers use for reference or directly prove their own views. The first is Joseph Gyourko et al., who found that after controlling the persistence in the evaluation sequence, the lagged value of the return of the trading real estate portfolio can predict the return of the index based on the evaluation [11]. By comparison, The research of K. C. Chan focused more on the related issues of REITs. They analyzed 18 to 23 REITs traded on major stock exchanges from 1973 to 1987, and concluded that REITs with higher leverage have greater impact than REITs with lower leverage. Measured by the return performance of equity REITs, real estate is usually less risky than stocks. From this statistical table, we can intuitively grasp the literature with important academic value in the field, and help researchers quickly learn important theoretical achievements in the field.

Table 3 Top 5 papers cited

Title	TC	TC/year	Normalized TC
What Does the Stock Market Tell Us About Real Estate Returns?	191	6.16	2.17
The Secondary Circuit of Capital Reconsidered: Globalization and the U.S. Real Estate Sector	179	10.53	9.22
Risk and Return on Real Estate: Evidence from Equity REITs	143	4.33	2.66

word factor analysis uses the method of multiple correspondence analysis to get figure 5. Multiple correspondence analysis can be used to study the relationship between three or more category variables, which is to perform simple correspondence analysis on the indicator variable matrix corresponding to one category variable level for each column of the matrix. From simple process to multiple process, more variable information can be obtained. The research focus is on two categories, from which we can see how each category is described by keywords. From figure 5, the research scope of REITs is relatively concentrated, and there are many kinds of small directions being explored by researchers.

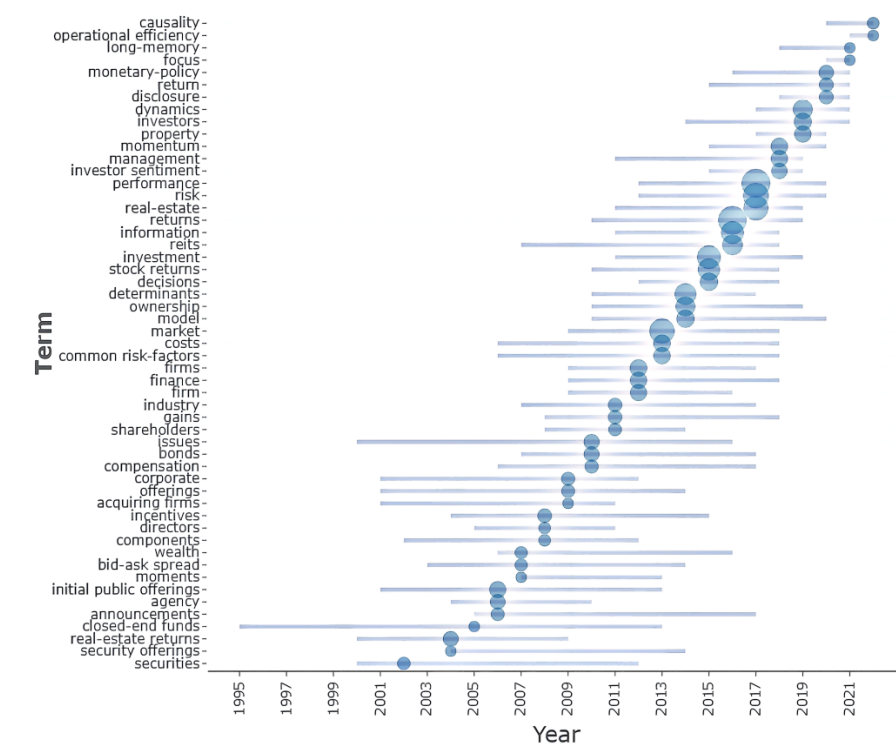


Fig. 4 Trend topics

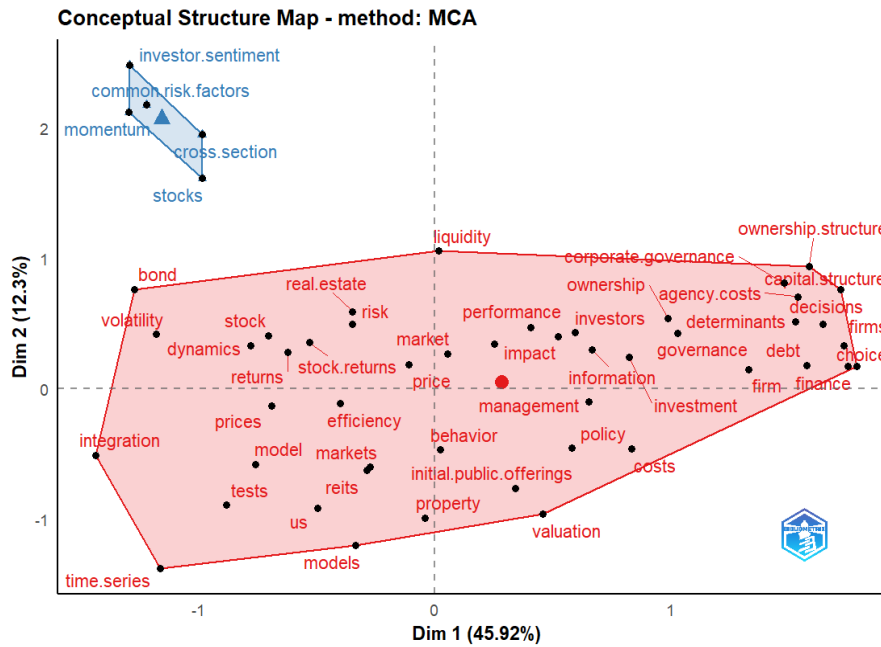


Fig. 5 Keyword factor analysis

3.5 REITs Process Model

In order to better understand and analyze REITs, this section uses IDEF0 language to complete the modeling of REITs process, and uses the constructed process model to better study REITs, so as to realize the comprehensive identification of REITs operation process. Based on the collection, analysis and induction of the current REITs research results, a REITs process model is constructed. Comprehensive reference is made to the following materials: the leading literature cited in the field of REITs, the latest research topics in the field of REITs, the Guidelines for Public Offering of Infrastructure Securities Investment Funds (Trial) issued by the CSRC, and the literature related to IDEF0 modeling. First, layer A-0 is obtained. The A-0 diagram is a comprehensive and abstract summary of REITs' activities from the most macroscopic perspective, as shown in figure 6:

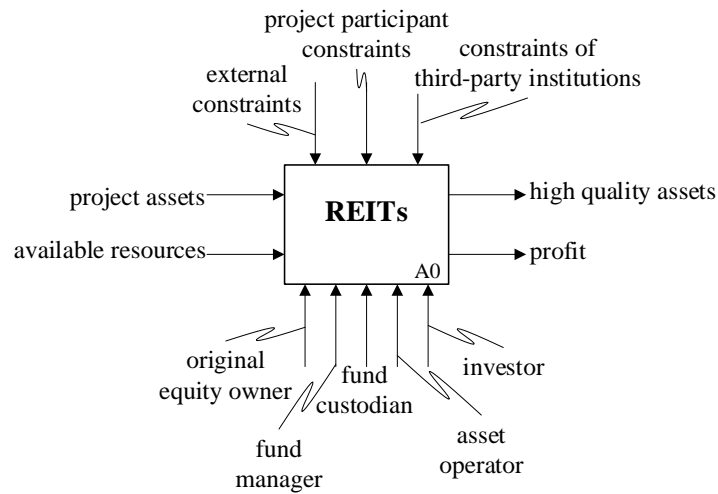


Fig. 6 REITs process model layer A-0

The input factor is the available resources related to the corresponding real estate or infrastructure projects and projects. After each process, the output is the business income and value-added income generated by the projects, as well as the high-quality assets after revitalization. In the whole process, the relevant personnel supporting REITs are the original stakeholders of the project, the fund management and custodian, the new operators, and the investors who inject capital. The whole activity is restricted by three main factors: multiple regulatory agencies (such as legal institutions and exchanges), multiple external environments, and the original participants of the project. The corresponding REITs process model can be obtained by disassembling the activities in layer A-0, as shown in figure 7.

4. Conclusions

From the perspective of bibliometrics, this study conducted a more comprehensive study in the field of REITs. The research obtained the output characteristics of REITs in terms of time, quantity, region, institution, publishing, scholars, etc. In addition, the United States has an absolute advantage in the quantity and quality of achievements. The research of institutions and authors in Asia has grown rapidly in recent years and has gradually entered the forefront of the world. According to the relevant analysis of the subject words, the relevant research of REITs mainly focuses on three levels: financing mode, income performance (market structure, policy, management, evaluation), risk prevention and analysis. At the beginning, REITs research mainly focused on the analysis of the real estate market and financial economic levels, such as market setting, multi party returns, risk management, interaction with the real estate market and other related such as

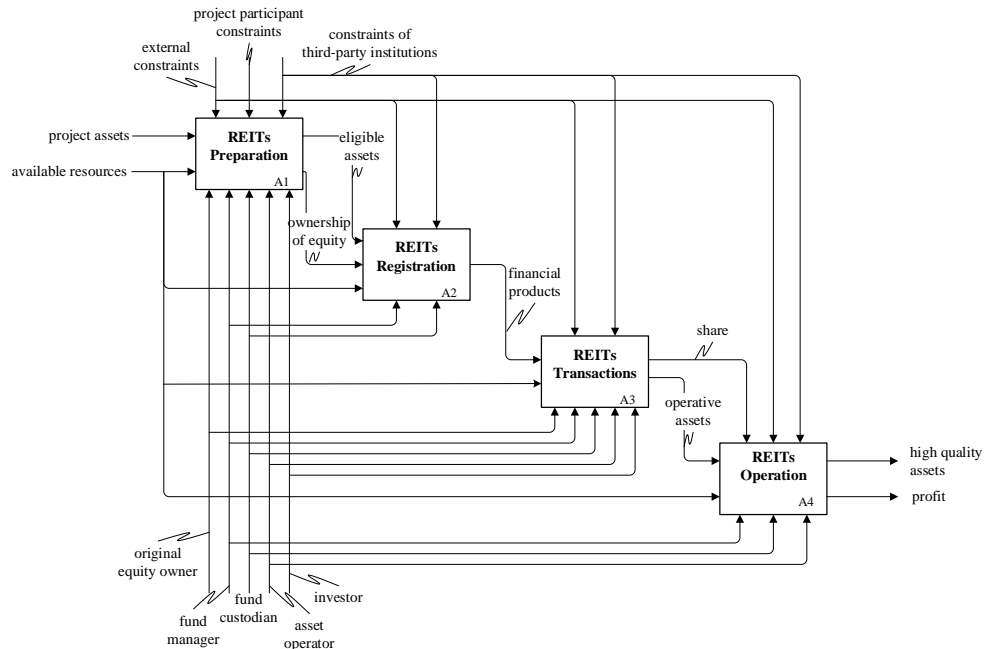


Fig.7 REITs process model

the oversupply of the real estate market, the emergence of the subprime crisis, and the improvement of the law. Research on REITs has also expanded from narrow real estate financial products to non-traditional investment, especially REITs in infrastructure. Whether academically or practically this kind of REITs has taken root in the United States and spread all over the world. Therefore, on the basis of literature review, this paper uses IDEF0 language to establish the REITs process model. Through hierarchical decomposition, researchers can model the described process from shallow to deep. Such modeling logic also facilitates researchers to understand and analyze the target process more deeply, find the deficiencies in the process and optimize it.

At the same time, there are also some problems through bibliometric analysis. On the one hand, the current academic research results on the relevant theories and cognition of REITs have not shown systematic and consensus consistency, and there is no scientific and professional model to evaluate REITs; On the other hand, most of the research on the application of REITs focuses on the real estate field, and there is still a lack of high-quality research results for new application forms such as infrastructure REITs; The REITs market in China started late, the market is not mature enough, and theoretical research based on China's national conditions is also lacking, so it is necessary to further improve the breadth and depth of Chinese REITs theoretical research. Based on the above discussion, this paper believes that the follow-up related research can further establish the systematic and scientific nature of the REITs theory and model, as well as the development path of REITs with Chinese characteristics.

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