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## Global Research of Future Trends and Development in Cash Holding: A Bibliometric View

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### Abstract

Cash holdings are becoming a growing issue for worldwide scholars in finance to understand the importance of the strategic approach of corporate cash policy of cash reserves. In practice, firms have faced challenges in adopting an appropriate corporate cash holdings policy. It would be appropriate to study the notions of cash holding (CH) to explore suitable strategies to overcome the inadequacy of financial policy of cash reserves in the financial system worldwide. Thus, this paper aims to conduct a bibliometric analysis and fill this literature gap by identifying and evaluating the current status and developing trends of the cash holdings domain to provide meaningful insights and assist in further discussion. Bibliometric studies have proven to be beneficial in helping researchers better exploring the current research trends in a particular field of research. From Scopus database, this study identifies the knowledge evolution trend in the field of cash reserves or cash holdings, where 1,073 published articles from year 1971 to 2022 were reported. The current study's findings demonstrate that the number of publications in the domain of cash holdings has intensified in the past few years. The results also identify that Economics, Econometrics, and Finance were the more popular subject categories in the field of cash holdings from the past few decades. In terms of keyword analysis, the most frequently used keyword by authors associated with cash holdings are corporate governance and financial constraints. Moreover, co-authorship with researchers finds that most collaboration has taken place among United States, China, and the United Kingdom. Finally, citation analysis reveals the Journal of Corporate Finance dominates this field of research. Future strings of research should focus on the cash holdings and financial constraints, investment and external drivers that have an effect on cash holdings.

**Keywords:** Cash Holdings, Corporate Governance, Financial Constraints, Investment, Financial Crisis, Bibliometric Analysis

## Introduction

Despite the availability and increase of several payment mechanisms, advanced countries still rely heavily on cash (Bagnall et al., 2016). Regarding the strategic impact of cash holdings, the motivation for this research work stems from the critical implications for financial management. Cash is considered an asset of strategic importance; the United States firms have dramatically raised their cash reserves since the mid-1990s. One of the most critical corporate decisions in the context of optimal capital structure challenges should be determining the optimal cash level by balancing the cost and benefits of holding cash (Drobetz & Grüninger, 2007). Holding cash is a valuable part of a corporate financial policy, and cash holding decisions are crucial for the sustainable development of corporate finance. In the past few decades, global cash holdings have increased. In addition, cash holding is the most common technique for corporations to keep enough liquidity (Almeida et al., 2014).

Cash assets, as one of the most prominent liquid assets in corporations, are essential for maintaining internal turnover, dealing with unexpected events, and daily business activities. Cash holdings can reflect the characteristics of operations of corporations and the strategic responsiveness of corporations to investment opportunities and external financing (Denis & Sibilkov, 2010; Opler et al., 1999).

Corporations have significantly increased their cash holdings in the last two decades, and it allows them to respond to daily financing operations, risk hedging, financing long-term investments, and unpredictable cash flow changes (Opler et al., 1999). Until now, prior studies have intensively reviewed the concept of cash holding. For instance, Opler et al (1999) conducted pioneer empirical research into the causes of cash reserves, which increased the interest in researchers in the field of cash holdings. However, despite increasing interest in cash holding globally, there is still a scarcity of studies evaluating and explaining the concept of cash holding (da Cruz et al., 2019). Therefore, researchers have remained to be interested in the firms' cash management activities. The literature on cash holdings has focused on the target of cash holdings and their determinants. For a variety of motives, corporations prefer to maintain cash holdings. For example, it helps corporations to avoid underinvestment losses due to reduced transaction costs and funds scarcity (Kim et al., 1998; Opler et al., 1999). It allows corporations to take advantage of opportunities for profitable investment (Ferreira & Vilela, 2004), it also contributes to reducing the cost of external financing (Almeida et al., 2004), and at times of economic distress, it is used to pay debt obligations (Acharya et al., 2007). When it comes to financial mechanisms, holdings of cash can be used to fund the operating activities of corporations in a period of financial difficulty (Campello et al., 2011). Furthermore, corporations are known to pass up valuable investment opportunities, especially when faced with financial constraints, so that cash can cover future shortfalls (Bates et al., 2009). These findings were supported by Almeida et al (2004) who contended that firms with tighter financial constraints are more inclined to save from incremental cash flows to protect their futures. As a result, to hedge from downturns, such corporations would retain a significant level of cash.

Limited structured literature reviews in this field of cash holdings have been conducted. As the body of knowledge in this field grows, scholars have realized that a literature review is essentially to better understand the state of the art in this field. Consequently, the objective of this article is to map studies on cash holdings. This research uses many articles to answer several questions about the holding of cash. The purpose of this paper is to perform a bibliometric analysis of the literature in the field of cash holdings to respond to the following concerns: (i) What is the current publication evolutionary trend of knowledge in the field of

cash holdings research? (ii) Which subject categories involving cash holdings are the most popular research? (iii) What are the most active source titles for research in the field of cash holdings? (iv) What are the hotspots keywords and co-occurrence in the domain of cash holdings (v) Which countries and institutions make the most contributions to research on cash holdings? (vi) Who are the most productive authors and co-authorship network in the topic of cash holdings?

This research is motivated by several important studies reviewed using the Scopus database for data mining, which covers a wide variety of topics and essential citation/abstract database (Khudzari et al., 2018). These studies provide insightful information which would further assisting researchers to understand their field of research (Drago & Aliberti, 2018; Yahaya et al., 2020; Zheng & Kouwenberg, 2019). Our larger number of samples (1947 to 2022) of literature enables us to map the development and contribution of cash-holding research and identify challenges and avenues for future research on this topic. Firstly, the bibliometric analysis used in the recent research demonstrates how academic interest has evolved over the years and highlights areas that require future trends in cash holdings research. Secondly, this bibliometric analysis can be helpful for corporations to increase their understanding of the complexity of areas regarding cash holdings. Thus, this paper is a bibliometric study that provides a macro picture of a research field, its evaluation, and connections among studies in order to be a starting point for future research, which contributes meaningfully to the earlier literature reviews in the area of cash holdings.

This paper is structured in the following way to assist researchers' answers to the research question. The background and motivation for conducting the bibliometric analysis are presented in this section. The technique for conducting the literature review is discussed in the following section. The current analysis of the methodological approach is discussed in the third section. Finally, the fourth section discusses the analysis findings.

### ***Literature on Cash Holding***

The cash held by corporations around the world has increased dramatically in recent years. Cash is essential and several scholars have discussed this type of investment including the following (Al-Najjar & Belghitar, 2011; Bigelli & Sánchez-Vidal, 2012; Brigham et al., 2004; Dittmar & Mahrt-Smith, 2007). Yu et al (2015); Yung and Nafar (2014) have identified an increased incidence of corporations' holdings of cash in unprecedentedly large amounts, demonstrating the importance of such assets in the corporate sector.

In the literature of cash reserves, a stream of scholars concentrated on the antecedent of cash holdings (Akben-Selcuk & Sener, 2020). These findings support the uniqueness of organizational practices and policies regarding cash reserves that differ across countries due to diversity in the firm's environment (Tahir & Alifiah, 2015).

Also, there are several motives why a corporation might hold cash reserves, including transaction motives, precautionary motives, and agency motives. These important motives have been introduced to help us better understand the antecedents and outcomes of cash holdings. The transaction motive of cash holdings shows the need for liquid assets to finance the company's day-to-day operations. When cash is inadequate at a critical time, a company may be required to liquidate assets to meet obligations, and it may also be obliged to pay the costs of the transaction. These costs can be avoided by maintaining more assets of liquid (Dittmar et al., 2003; Drobetz & Gruninger, 2007; O'Brien & Folta, 2009). The asymmetric information impact on external fundraising leads to the precautionary motive. There are unexpected additional expenses such as rising costs, price fluctuations, raw material

availability, or other unforeseeable circumstances in a corporation's future. In such situations, cash holdings help the corporations meet their needs (Kawase et al., 2015; Ozkan & Ozkan, 2004; Xu et al., 2019).

The agency motive of cash holdings suggests the conflict of interest between executives and owners. When senior executives do not perform in the best interests of the stockholder, they may use the excess cash of the firm for maximizing their personal income rather than to serve the owner (Jensen, 1986). Consequently, it is evidenced that entrenched top managers are more likely to keep more cash reserves for their personal gains. Lee and Lee (2009) prove that the link between managerial ownership and cash holdings is positive and significant. Despite these findings on cash reserves, there is little information about how holdings of cash affect outcomes (Jebran et al., 2019).

There is a need for conducting comprehensive research to evaluate and review the topic of cash holdings from a diverse review of research. A few studies have concentrated on evaluating and describing research publications from a global perspective (Aliyev et al., 2019; Block et al., 2020; Block & Fisch, 2020), while other researchers have particularly focused on determinants that affect cash holdings (He, 2018; Weidemann, 2018). Similarly, there is a highlight on the cash holdings determinant and its relationship with corporate governance (Amess et al., 2015).

The managers of corporate finance need to design the optimal cash policies to finance organizational goals. Financial managers may opt to distribute cash to investors, reinvest the cash or keep the cash in the firm based on the cash inflows. Previous literature suggests that the majority of managers frequently prefer to keep a significant part of the assets of firms in the form of cash or other liquid securities because a firm may benefit from saving transaction costs when it needs to increase funds (Acharya et al., 2012; Fernandes & Gonenc, 2016). Almeida et al (2014) argue that sufficient corporate liquid allows a firm to increase the value of investments. However, holding liquidity assets can be costly for a corporation due to taxation and liquidity premium cost, hidden opportunity costs, and low rate of return (Wu et al., 2012).

This research adds to the current knowledge of cash holdings by thoroughly evaluating previous studies. This study provides an overview of the research landscape in the field of cash holdings and provides motivating observations and future research prospects. This study also contributes to the theoretical development of cash holdings research by assisting academics in identifying potential possibilities and significant research themes in the cash holdings literature (Shi & Li, 2019). Our study differs from past reviews in that it is the first to combine a literature review with a bibliometric analysis of cash holdings, providing a supplementary approach to the more conventional literature review.

Additionally, it has been found that pecking order, trade-off, agency, and theories are the most relevant theoretical aspects in this field; however, the holdings of cash interaction theories remain unknown. The current analysis of the methodological approach in the next section. Finally, the results conclude with a conclusion and recommendations for further research.

## **Methodology**

The structured method of all articles published in a field of finance in terms of the number, connection, productivity, quality, citations, and evaluating the intellectual development of the particular field of finance is defined as bibliometric analysis. A scientific field's research activity can be an excellent tool for understanding its structure (Ronda-Pupo, 2017).



Moreover, as per Block and Fisch (2020), which provide only a list of references (for example, leading research, authors, and organizations) followed by a brief explanation does not qualify the research as a bibliometric study; rather a bibliometric study should focus on assessing the structure of a particular research field. Therefore, we conducted an effective bibliometric study that analyses research on cash holdings, implementing the instructions provided by the novel work of scholars. This method would assist us in understanding the evolution of a finance field. This section presents a complete explanation of the nature and source of the data used in the latest analysis. In addition, it provides the methodological approach in the data analysis. To get a comprehensive view of the literature on cash holdings research, the Scopus database was selected as a data depository from which all documents related to this analysis are retrieved. It is evidenced that Scopus database is sufficient in deliberating similar research in many domains, including finance. Scopus is one of the prominent databases with a unique indexing mechanism (De Winter et al., 2014). In the field of economics, econometrics, and finance, the Scopus database has a broader coverage of research materials (Hallinger & Kovačević, 2019; Martín-Martín et al., 2018). The search query was applied on 21<sup>st</sup> Dec 2022 from the Scopus database. Therefore, we developed a central theme research string after reviewing similar publications, definitions, and categories of cash holdings. As shown in Figure 1, an initial search resulting in a total of 1073 in which the result obtained from the research protocol outlined in Table 1. However, after excluding 49 less relevant documents such as book chapters, letters, Notes, book series, trade journals, a total of 1,024 documents were considered eligible for the analysis.

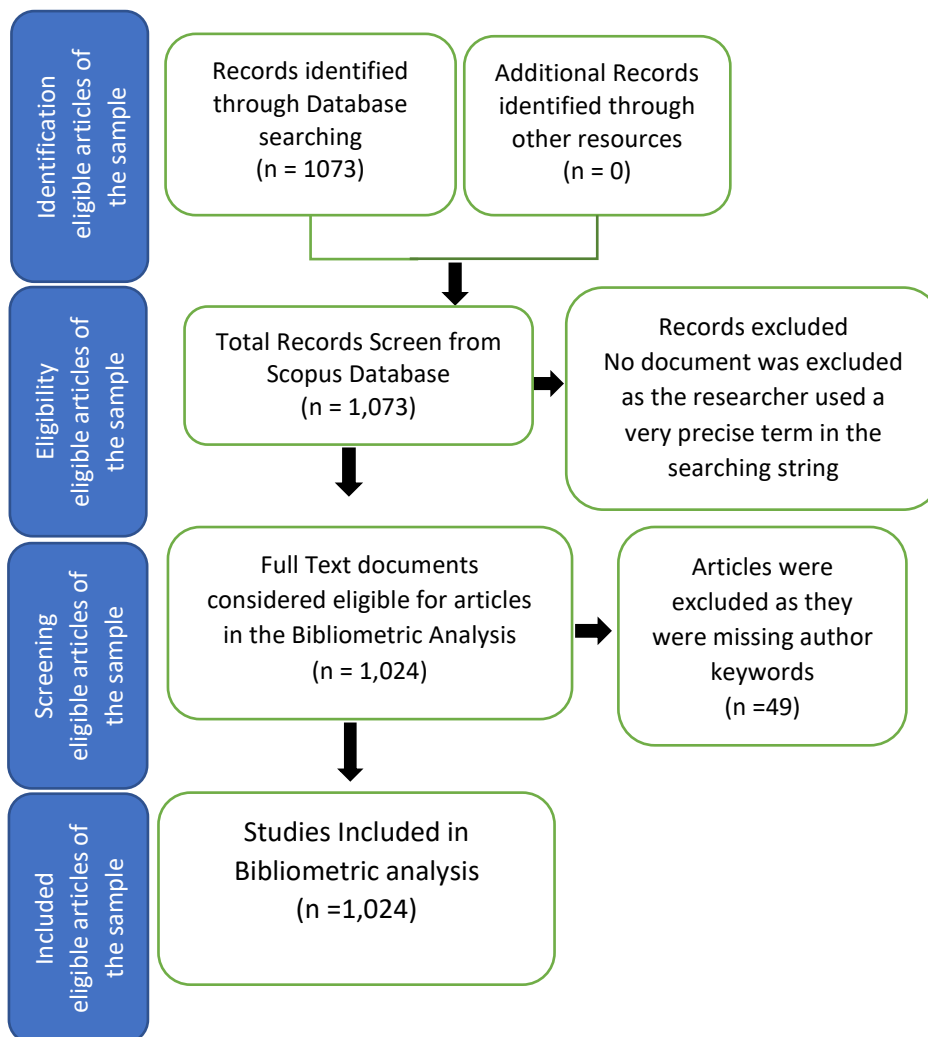
Table 1  
*Research Protocol*

<b>Criteria</b>	<b>Protocol Description</b>
Database	Scopus
Search Phrases	cash holdings, holdings of cash, cash reserves, corporate cash holdings
Boolean Operator	OR between group
Search String	("Cash Holdings" OR "Holdings of Cash" OR "Cash Reserves" OR "Corporate Cash Holdings") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "cr")) AND (LIMIT-TO (SRCTYPE, "j") OR LIMIT-TO (SRCTYPE, "p"))

***Bibliometric Analysis Methods***

The modern bibliometric analysis includes a quantitative analysis of research articles and citation information related to documents obtained from the Scopus database as shown in Figure 1.

**Data Collection**



**Figure 1. Diagram of the workflow for conducting bibliometric research**

This database has the advantage of allowing researchers to import a bibliography database for all of their final results, including citations matrix, publisher, affiliation, etc into a simple excel CSV file. The data obtained from search results are exported in CSV and RIS file format for the current study. Harzing's Publish or Perish, VOSviewer, and Microsoft Excel applicants are some of the analysis tools used for this research analysis. Harzing's Publish or Perish is used to get citation information and other impact matrices which include h-index and g-index. We used VOSviewers to map the literature as it is an advanced software application for generating a visualized map based on the link to the spectral information (Behrend & Eulerich, 2019).The VOSviewer software is also widely used to create the visualization map of author keywords, co-authorship, and co-occurrence networks.

**Results**

**a. The Evolution and Characteristics of Published Research**

In order to respond to the first research question, (RQ1: What is the current publication evolutionary trend of knowledge in the field of cash holdings research?), this study analyses the evolutionary trend in knowledge development in the field of cash holdings research. A total number of 1024 documents were published in the Scopus database between 1971 to

2022, out of which 597 articles (representing 58.3 %) are published in the last five years, as shown in Table 2. This signifies the current expansion of the cash holdings research. In 1999, the highest number of cited publications (NCP = 1603) was reported. However, in the year 2000 has the highest number of total citations at (TC = 2,998). The h-index recorded its number of highly cited publications in 2011 while the g-index recorded its number of highly cited papers in 2014. Furthermore, Table 3 demonstrates that journal articles (957) are the most highly cited documents, representing 93.46 percent of all documents under review, with 43 conference papers, 22 review papers, and 2 conference reviews.

Table 2  
*Year of Publications*

<b>Year</b>	<b>TP</b>	<b>(%)</b>	<b>Cumm. %</b>	<b>NCP</b>	<b>TC</b>	<b>C/P</b>	<b>C/CP</b>	<b>h</b>	<b>g</b>
1971	1	0.10	0.10	1.00	1.00	1.00	1.00	1	1
1979	1	0.10	0.20	5.00	5	5.00	1.00	1	1
1983	2	0.20	0.39	2.50	5	2.50	2.00	1	2
1985	1	0.10	0.49	335.00	335	335.00	1.00	1	1
1989	2	0.20	0.68	274.50	549	274.50	2.00	2	2
1990	3	0.29	0.98	75.00	225	75.00	3.00	2	3
1995	3	0.29	1.27	76.00	228	76.00	3.00	3	3
1997	2	0.20	1.46	91.00	182	91.00	2.00	1	6
1998	2	0.20	1.66	39.00	78	39.00	2.00	2	2
1999	1	0.10	1.76	1603.00	1603	1603.00	1.00	1	1
2000	4	0.39	2.15	749.50	2998	749.50	4.00	2	4
2001	4	0.39	2.54	66.25	265	66.25	4.00	3	4
2002	3	0.29	2.83	24.00	72	24.00	3.00	2	3
2003	5	0.49	3.32	231.60	1158	231.60	5.00	4	5
2004	8	0.78	4.10	298.00	2384	298.00	8.00	6	8
2005	5	0.49	4.59	16.60	83	16.60	5.00	3	5
2006	10	0.98	5.57	177.70	1777	177.70	10.00	9	10
2007	18	1.76	7.32	98.83	1779	98.83	18.00	10	18
2008	10	0.98	8.30	122.20	1222	122.20	10.00	8	10
2009	16	1.56	9.86	72.50	1160	72.50	16.00	12	16
2010	20	1.95	11.82	65.25	1305	65.25	20.00	11	20
2011	38	3.71	15.53	56.29	2139	56.29	38.00	23	38
2012	30	2.93	18.46	28.53	856	28.53	30.00	13	29
2013	34	3.32	21.78	38.79	1319	38.79	34.00	16	34
2014	46	4.49	26.27	36.22	1666	36.22	46.00	20	40
2015	49	4.79	31.05	27.20	1333	27.20	49.00	18	36
2016	43	4.20	35.25	17.14	737	17.14	43.00	15	26
2017	66	6.45	41.70	22.55	1488	22.55	66.00	21	37
2018	92	8.98	50.68	12.85	1182	12.85	92.00	19	29



2019	69	6.74	57.42	13.09	903	13.09	69.00	17	26
2020	109	10.64	68.07	11.45	1248	11.45	109.00	16	31
2021	133	12.99	81.05	4.94	657	4.94	133.00	9	21
2022	190	18.55	99.61	0.96	183	0.96	190.00	6	8
2023	4	0.39	100.00	0.00	0	114.33	0.00	0	0
	1024	100.00							

Notes: TP = Total number of Publications; NCP = Number of cited Publications; TC = Total citations; C/P = Average citations per Publications; C/CP = Average citations per cited Publication; h = h -index; g = g – index.

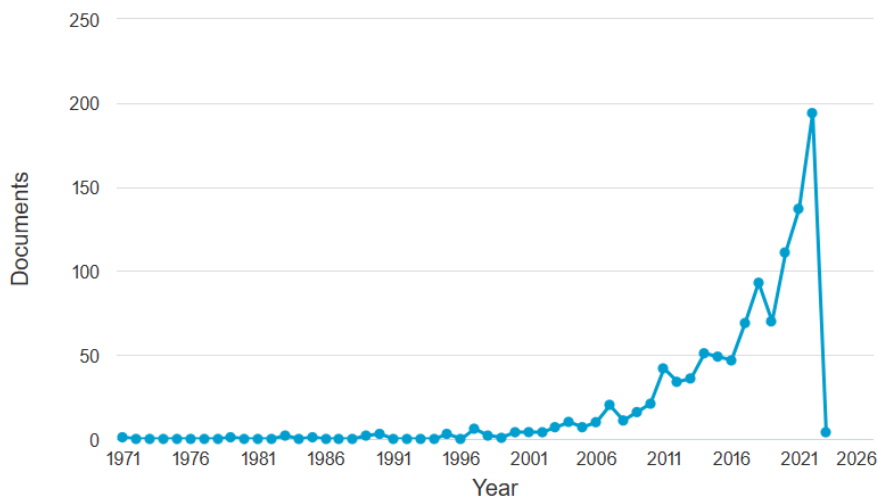


Figure 2. Trend of Publications between 1910 to 2022

Table 3

Document Type

Document Type	Total Publications (TP)	Percentage (%)
Article	957	93.46
Conference Paper	43	4.20
Review	22	2.15
Conference Review	2	0.20
Total	1024	100.00

The most prevalent language is English, which represents 98.44 % of the published documents under analysis as shown in Table 4. Moreover, seven documents have been published in the Chinese language (0.68) while other documents have been published in other different languages such as French, Korean, Spanish, and Arabic. In addition, two documents have been published in dual languages.

Table 4

*Languages Used for Publications*

<b>Document Type</b>	<b>Total Publications (TP)*</b>	<b>Percentage (%)</b>
English	1011	98.44
Chinese	7	0.68
French	2	0.19
Korean	1	0.10
Spanish	1	0.10
Arabic	1	0.10
Czech	1	0.10
Germany	1	0.10
Polish	1	0.10
Russian	1	0.10
Total	1027	100.00

Note: Two documents have been published in dual languages

**b. Subject Area**

In order to respond to the second research question (RQ2: What are the most popular subject categories in cash holdings research?) The current article categorizes publications into subject areas in the field of cash holdings. Table 5 shows the most popular subject categories which; include Economics, Econometrics, and Finance (763 Total Publication of documents representing 45.47% of total records); Business, Management, and Accounting (590 Total Publication of documents representing 35.16% of total records); Social Science (97 documents representing 5.78% of total records); Decision Sciences (39 documents representing 2.32% of total records); Engineering (30 documents representing 1.79% of total records); Computer Science (39 documents representing 2.32% of total records); Mathematics (23 documents representing 1.37% of total records); Environmental Science (24 documents representing 1.43% of total records); Medicine (5 documents representing 0.3% of total records); Agricultural and Biological Sciences (8 documents representing 0.48 % of total records); Energy (21 documents representing 1.25% of total records); Art and Humanities (10 documents representing 0.60% of total records). Additionally, other contributing Subjects of the field include Earth and Planetary Sciences, Biochemistry, Genetics, and Molecular Biology, Physics and Astronomy, Multidisciplinary, Psychology, Chemical Engineering. Materials Science, Pharmacology, Toxicology and Pharmaceutics, Veterinary.

Table 5

*Most Popular Subject Area*

<b>Subject Area</b>	<b>Total Publications (TP)</b>	<b>Percentage (%)</b>
Economics, Econometrics and Finance	763	45.47
Business, Management and Accounting	590	35.16
Social Sciences	97	5.78
Computer Science	39	2.32
Decision Sciences	39	2.32
Engineering	30	1.79
Environmental Science	24	1.43
Mathematics	23	1.37
Energy	21	1.25
Arts and Humanities	10	0.60
Agricultural and Biological Science	8	0.48
Earth and Planetary Sciences	6	0.36
Psychology	6	0.36
Medicine	5	0.30
Multidisciplinary	3	0.18
Biochemistry, Genetics and Molecular Biology	2	0.12
Chemical Engineering	2	0.12
Chemistry	2	0.12
Materials Science	2	0.12
Pharmacology, Toxicology and Pharmaceutics	2	0.12
Neuroscience	1	0.06
Physics and Astronomy	1	0.06
Veterinary	1	0.06
Undefined	1	0.06
	1678	100.00

***c. Most Active Source Titles***

The most active source of titles in the field of cash holdings is presented in this research. The information is given to respond to the third research question (RQ3: What are the most active source titles for research in the field of cash holdings). The ranking related to these sources is provided in Table 6, comprised in the table is the publishers and another citation index. At the top of the list is Journal of Corporate Finance (76: Total Publications), Journal of Financial Economics (41: Total Publications), Journal of Banking and Finance (34: Total Publications), Accounting and Finance (24: Total Publications), International Review of Economics and Finance (22: Total Publications). The Journal of Finance presented the highest number of total citations of 10,764. Furthermore, the Journal of Finance has the highest h (50) and g (98) indexes as per, in the most active source title as seen in Table 6.

Table 6

Most Active Source Title

Source Title	TP	TC	C/P	Publisher	Cite Score (2022)	SJR (2022)	SNIP (2022)	Quartile	h	g
Journal of Corporate Finance	76	2534	29.81	Elsevier	4.9	1.894	2.665	Q1	28	49
Journal of Financial Economics	41	10351	188.2	Elsevier	9.6	11.673	5.656	Q1	32	55
Journal of Banking and Finance	34	1957	40.77	Elsevier	4.4	1.58	2.166	Q1	23	44
Accounting and Finance	24	1102	12.11	Wiley-Blackwell	3.3	0.645	1.517	Q2	20	30
Journal of Financial and Quantitative Analysis	22	1339	49.59	Cambridge Univeristy Press	5.3	4.657	3.034	Q1	14	27
Journal of Finance	22	10764	53.82	Wiley-Blackwell Publishing Ltd	11.2	18.151	6.925	Q1	50	98
International Review of Economics and Finance	22	212	8.83	Elsevier Inc.	3.6	0.781	1.521	Q2	9	13
Pacific Basin Finance Journal	20	292	12.7	Elsevier	3.2	0.697	1.521	Q2	6	17
Review of Financial Studies	20	1788	81.27	Oxford Univeristy Press	9.2	12.8	5.065	Q1	17	22
Applied Economics	20	212	5.58	Taylor and Francis Ltd.	2.3	0.569	1.029	Q2	7	13
International Review of Financial Analysis	20	182	9.1	Elsevier Inc.	4.9	1.27	1.097	Q1	7	13
Review of Quantitative Finance and Accounting	16	263	13.15	Springer New York	2.6	0.664	1.444	Q2	8	16
Journal of Business Finance and Accounting	15	396	19.8	Wiley-Blackwell Publishing Ltd	3.3	1.282	1.738	Q1	8	19
Managerial Finance	15	119	4.25	Emerald Group Publishing Ltd.	1.5	0.271	0.656	Q3	6	10
Emerging Markets Finance and Trade	15	89	5.56	M.E. Sharpe Inc.	2.6	0.537	0.998	Q1	4	9

Notes: TP = Total number of Publications; NCP = Number of cited Publications; TC = Total citations; C/P = Average citations per Publications; C/CP = Average citations per cited Publication; h = h -index; g = g – index.

**d. Author Keywords and Text Analysis**

**Keywords Analysis of Hotspots**

To respond to the fourth research question, (RQ4: What are the hotspots keywords and co-occurrence in the field of cash holdings?) Author keywords such as Cash Holdings (385: Total Publications), Corporate Governance (160: Total Publications), Cash holding (67: Total Publications), Corporate Cash Holdings (67: Total Publications), Financial Constraints (48: Total Publications), Investment (40: Total Publications), Firm Value (33: Total Publications), are found as the most regularly used authors' keywords in the field of cash holdings as shown in Table 7. Moreover, the network visualization of author keywords used in the research of cash holdings is mapped out using VOSviewer as shown in Figure 3. The network line in the figure represents the link between different keywords of the authors.

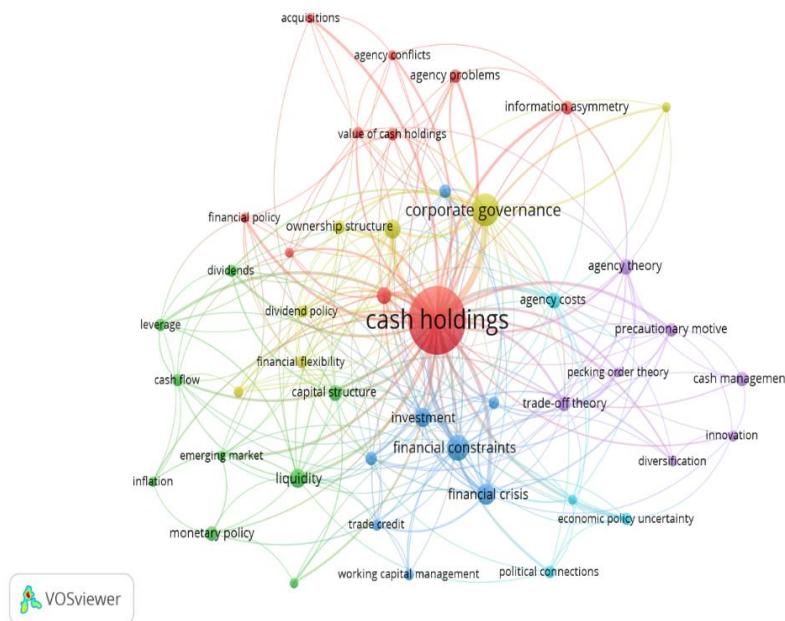


Figure 3. The Bibliometric Network Visualization Map of the Authors' Keywords (Minimum order of the Occurrence=10)

Furthermore, Figure 3 shows six distinct keywords for the authors' clusters that were identified in the field of cash holdings research. Initially, the first cluster shown in red colour comprises cash holdings, the value of cash holdings, corporate social responsibility, financial policy, agency conflicts, and agency problems, including other keywords for the author. The author's keywords cash holdings have been most frequently used in the first red cluster and total publications as well. The second cluster labeled by green colour represents liquidity, capital structure, and cash flow, with other authors' authors' keywords. The third cluster described in blue colour denotes authors' keywords such as financial constraints, investment, financial crisis, agency cost and working capital management, and firm performance. The corporate governance keywords have been frequently used in the fourth yellow cluster. The fourth cluster indicated by yellow colour consists of corporate governance, board of directors, firm value, dividend policy, liquidity management, and financial flexibility, with other keywords for the authors. Furthermore, keywords for the authors such as precautionary motive, pecking order, trade-off, agency theories, and diversification, can be observed in the fifth cluster by a purple label. The final cluster demonstrated in sky blue includes agency costs, political connections, economic policy uncertainty, and cash policy.

Table 7

Top Ten Authors' Keywords

<b>Author Keywords</b>	<b>Total Publications (TP)</b>	<b>Percentage (%)</b>
Cash Holdings	385	38.38
Corporate Governance	160	15.95
Cash Holding	67	6.68
Corporate Cash Holdings	67	6.68
Financial Constraints	48	4.79
Investment	40	3.99
Firm Value	33	3.29
China	31	3.09
Financial Crisis	31	3.09
Agency costs	24	2.39
Agency Theory	24	2.39
Value of cash	24	2.39
Corporate social responsibility	23	2.29
Finance	23	2.29
Investments	23	2.29

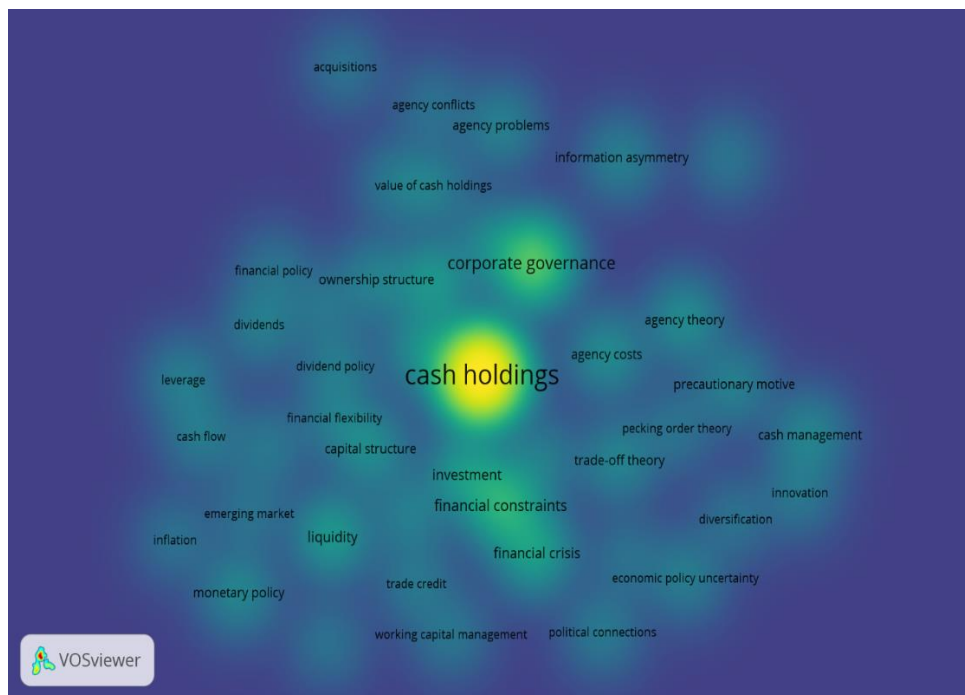


Figure 4. The Bibliometric Density Visualization Map of Author Keywords co-occurrence.

Figure 4 presents the heat map of keywords for the authors that were identified in the field of cash holdings research. Moreover, the most frequent keywords are in the yellow area, which are cash holdings, corporate governance, financial constraints and financial crisis. Other keywords, such as agency cost, and dividend policy, are not commonly used.



**e. Geographical Distribution of Publication****Countries contributed to the Publications**

In respond to the fifth research question (RQ5: Which countries and institutions make more contributions to research on cash holdings?). This paper evaluated the top twenty countries (Table 8) and institutions (Table 9) that have provided contributions to the field of cash holdings research. Based on the search results, a total number of 75 countries were included in the current analysis. The United States indicates the highest total publications (317 documents) and total citations (16,888). China is the second country with the highest publications (194 documents) and total citations (1,550). The United Kingdom had the third-highest total publications (118 documents) and citations (3,017). Furthermore, other contributing countries of total publications and citations include, Australia (64 documents), Taiwan (56 documents), South Korea (49 documents), Malaysia (34 documents), among other counties. Likewise, considering the h and g indexes, the United States (h=61, g=125), China (h=21, g=33), and United Kingdom (h=28, g=51), also play a prominent role. South Korea and United States hold on average citations per publication of 59.20 and 53.27 respectively.

Table 8

**Top Twenty Countries Contributed to the Publications**

<b>Countries</b>	<b>TP</b>	<b>NCP</b>	<b>TC</b>	<b>C/P</b>	<b>C/CP</b>	<b>h</b>	<b>g</b>
United States	317	84.44	16888	53.27	200.00	61	125
China	194	7.75	1550	7.99	200.00	21	33
United Kingdom	118	22.02	3017	25.57	137.01	28	51
Australia	64	19.73	1322	20.66	67.00	16	35
Taiwan	56	5.71	371	6.63	64.97	9	17
South Korea	49	46.79	2901	59.20	62.00	21	53
Malaysia	34	9.56	564	16.59	59.00	13	22
Viet Nam	34	11.04	574	16.88	51.99	9	23
Canada	33	22.47	966	29.27	42.99	15	30
India	29	15.95	606	20.90	37.99	13	24
France	28	25.34	963	34.39	38.00	15	31
Hong Kong	26	21.53	775	29.81	36.00	11	27
Germany	23	4.56	155	6.74	33.99	6	11
Italy	20	5.16	160	8.00	31.01	8	11
New Zealand	18	16.44	444	24.67	27.01	7	21
Spain	27	4.26	115	4.26	27.00	7	10
Switzerland	26	31.81	827	31.81	26.00	13	26
Pakistan	22	4.45	98	4.45	22.02	6	9
Indonesia	19	1.84	35	1.84	19.02	4	5
Netherlands	16	14.19	227	14.19	16.00	9	15

Notes: TP = Total number of Publications; NCP = Number of cited Publications; TC = Total citations; C/P = Average citations per Publications; C/CP = Average citations per cited Publication; h = h -index; g = g – index.

**Most Influential Institutions**

As presented in Table 9, the National Bureau of Economic Research (NBER) of the United States tops the list of most influential institutions with 17 publications. The University of

Economics Ho Chi Minh City of Vietnam is the second most influential institution with (13) total publications. It is followed by the Renmin University of China and Dongbei University of Finance and Economics with 12 total publications. Moreover, four institutions such as Hong Kong Curtin University, the University of Arizona, Foreign Trade University, and the Curtin University published 11 documents each to merge as the 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> positions. It is followed by Peking University and Xiamen University, with 10 publications. This result is further elaborated on Figure 5.

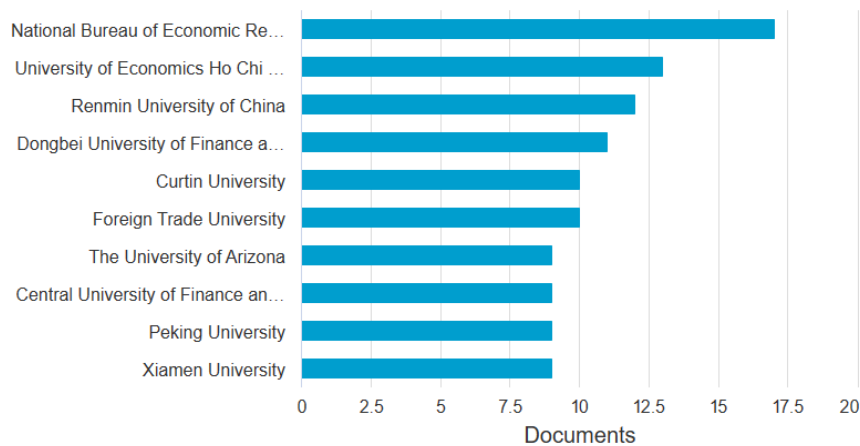


Figure 5. Top Ten Affiliation contributed to the Publications

Table 9

*Top Ten Influential Institutions of the Publications*

Affiliation	Country	Total Publications
National Bureau of Economic Research	United States	17
University of Economics Ho Chi Minh City	Vietnam	13
Renmin University of China	China	12
Dongbei University of Finance and Economics	China	12
Curtin University	Australia	11
Foreign Trade University	Vietnam	11
The University of Arizona	United States	11
Central University of Finance and Economics	China	11
Peking University	China	10
Xiamen University	China	10

#### ***f. Authorship and Co-authorship Analysis***

##### ***Most Productive Authors***

Responding to the sixth research question (RQ6: Who are the most productive authors and co-authorship in the domain of cash holdings?) the most productive authors and co-authorship in the field of cash holdings are highlighted in this paper. Table 10 shows the cash holdings authors, total publications, citations information, h, and g indexes accordingly. Considering contribution in terms of the number of publications, Tran, Q.T. affiliated with Foreign Trade University has the highest number of publications in the domain of cash holdings based on Scopus, with 10 total publications (to mention a few most popular; (Thi et al., 2021; Tran, 2020, 2021). Drobetz, W. affiliated with the University of Hamburg is the

runner-up, contributing 8 articles to the domain (Ahrends et al., 2018; Ahrends et al., 2018). Chan, K. C. of Western Kentucky University, Chen, N. of National Chiayi University, Lozano, M. B. of Universidad de Salamanca, Ozkan, N. and Sun, L of the University of Bristol are tried for contributing 7 documents (Dong et al., 2021; Flugum et al., 2020; Karpuz et al., 2020; Lozano & Yaman, 2020). The Williamson, R. presents are highest in terms of the number of total citations (TC =1975) and average citation per publication (C/P = 329.17) as predicts in table 10. Considering the expand of research affect, Drobetz, W. has the highest (h- index = 7) and (g-index = 8).

Table 10  
Most Productive Authors

<b>Author's Name</b>	<b>Affiliation's</b>	<b>Countries</b>	<b>TP</b>	<b>NCP</b>	<b>TC</b>	<b>C/P</b>	<b>C/CP</b>	<b>h</b>	<b>g</b>
Tran, Q.T.	Foreign Trade University	Viet Nam	10	2.70	27	2.70	10	3	5
Drobetz, W.	University Hamburg	Germany	8	30.00	240	30.00	8	7	8
Chan, K.C.	Western Kentucky University	United States	7	18.00	126	18.00	7	3	7
Chen, N.	National Chiayi University	Taiwan	7	6.71	47	6.71	7	3	6
Lozano, M. B.	Universidad de Salamanca	Spain	7	3.43	24	3.43	7	3	4
Ozkan, N.	University of Bristol	United Kingdom	7	78.57	550	78.57	7	5	7
Sun, L	University of Bristol	United Kingdom	7	3.00	21	3.00	7	2	4
Harford, J.	School of Business	United States	6	313.50	1881	313.50	6	5	6
Williamson, R.	McDonough School of Business	United States	6	329.17	1975	329.17	6	5	6
Acharya, V.V.	Leonard N. Stern School of Business	United States	5	36.00	184	36.80	5	3	5

Notes: TP = Total number of Publications; NCP = Number of cited Publications; TC = Total citations; C/P = Average citations per Publications; C/CP = Average citations per cited Publication; h = h -index; g = g – index. This data is extracted as of August 2021.

**Visualization Map of Co-authorship**

The bibliometric coupling of co-authorship in cash holding research is depicted in Figure 6. The threshold for the coupling is based on the at least 3 authors with a minimum of 5 citations. The countries at least three author’s publications and at least five total citations appear in the output. As per the findings, the United States, China, United Kingdom, Australia, South Korea, Canada, Taiwan, India, France, Germany, and Hong Kong most collaborate in cash holdings research. Therefore, these countries have highly contributed significance to this body of

knowledge in terms of total publications. However, the United States was the first country to publish research on cash holdings (Sprague, 1910). Thus, the United States has developed close collaboration with most countries with high cash holdings research linkages, and the United States established articles have been published since 1910. China also has close research linkages with other countries.

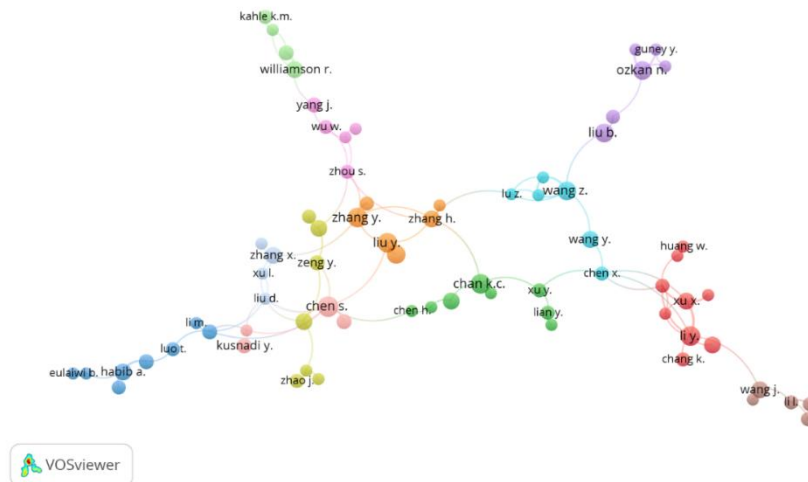


Figure 6. The Bibliometric Network Visualization Map of the Co-authorship

**Visualization Map of Countries**

The bibliometric coupling of co-authorship in cash holdings research, as seen in Figure 7. The coupling limit has based on at least three authors with a minimum of 5 citations. Global research collaboration provides knowledge communicating opportunities between researchers in developed countries, including emerging and developed countries (Palacios-Callender & Roberts, 2018). According to the VOS viewers' output, Tran, Q. T. is the author who collaborates the most with other scholars. The circle of the network in different colours represents a group of authors. Similarly, the research collaboration in one colour indicates joint authorship of researchers.

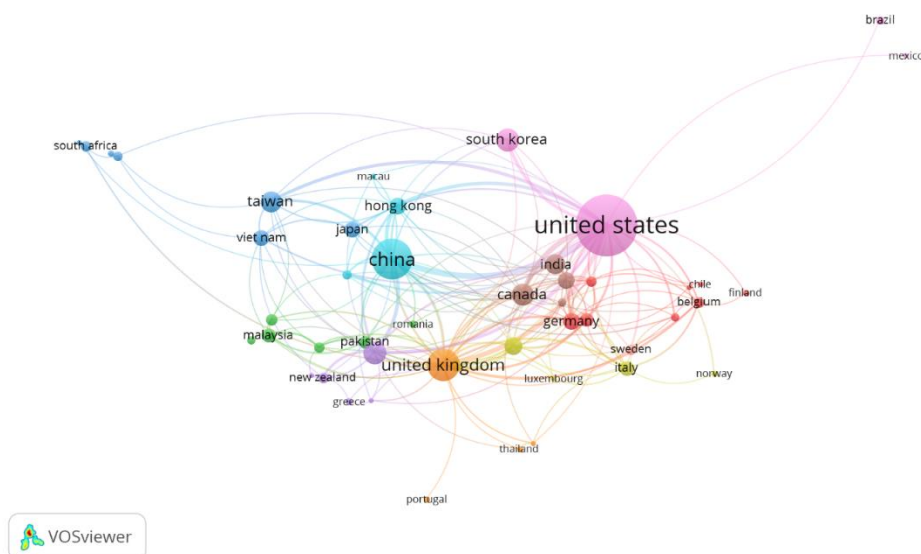


Figure 7. The Bibliometric Network Visualization Map of the countries

### **Conclusion and Limitation for Future Research**

Cash holdings are considered as a beneficial aspect at the heart of financial policy of corporations. In fact, holdings of cash are the most widely used approach for corporations to retain adequate liquidity. Corporations all over the globe have substantially increased their cash holdings in the past two decades. As a result, researchers have become increasingly interested in their cash holdings issues, particularly since the global financial crisis of 2007. More work on cash holdings is expected soon, assessing the implications of the covid-19 pandemic on cash holdings (Khatib & Nour, 2021). Despite the rising availability of empirical research on cash reserves, there is a scarcity of reviewing research that analyzes and evaluates cash holdings articles from a global perspective and diverse aspects of the field.

This paper aimed to map research on cash holdings and provide a bibliometric analysis exploring the collaboration of cash holdings as an interrelated issue to the current literature in this field. We used bibliometric analysis to evaluate the development of global cash holdings research from a different perspective. The data used in this research was retrieved from the Scopus database (1073 journal articles) due to a lack of hotspot keywords; 49 articles were excluded from the keyword analysis.

The bibliometric analysis includes total publications, source titles, global coverage institutional, relevant authors, and impact of citations. The bibliometric research found that most articles have been published in the top journals in the field, such as the Journal of Corporate Finance and Journal of Financial Economics. Furthermore, the content search was limited to themes identified by keyword and cluster analysis, such as corporate governance, financial constraints, investments. Generally, the findings suggest that the number of publications has been rapidly increasing since the financial crisis. Interestingly, developed countries (the United States, China, and the United Kingdom) contributed 50%, including all global articles, with only a few studies in Africa, Latin America, and the Middle East countries. Therefore, we encourage scholars to dig deeper into the developing countries of cash holdings research, particularly single-industry studies, as it has been indicated that industries may differ in terms of liquidity need and other factors impacting cash holdings level.

Furthermore, the findings show the National Bureau of Economic Research as the top influential institution of the publications that contribute to the knowledge of cash holdings. Moreover, the analysis highlights the tremendous contributions of Tran, Q. T, and Drobetz, W. to the field of cash holdings in terms of highly productive authors.

Our literature review has several limitations, like other researchers and future researchers could expand on the existing analysis about cash holdings and cash reserves to address the gaps. To start, the methodology used in this study was restricted to "cash holdings" or "cash reserves" within titles and keywords. However, some research may not refer to the cash holdings and cash reserves within the searching scope. From the theoretical point of view, this paper is a bibliometric analysis that provides a macro picture of a research field, its evolution, and connections among studies in order to be a starting point for future research by highlighted issues among cash holdings and cash reserves research domains, while also providing a comprehensive overview of the literature from a different perspective not implemented in the previous analysis. Additionally, we restricted our search to the Scopus database, which is widely considered the most extensive citation and abstract collection of peer-reviewed literature. Therefore, further research might compare the outputs from multiple databases.

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