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### **A bibliometric study of financial innovation development trends**

#### **Abstract:**

**Object:** The purpose of this article is to identify and analyse the most influential authors, publications, countries, journals on financial innovation and the key trends in their development of financial innovations using bibliometric method based on Web of Science Core Collection data using VOSviewer.

**Methods:** This study used the quantitative and qualitative method. The PRISMA approach helped to sort out 942 articles on the financial innovation topic. The science mapping analysis as the citation analysis of documents, authors and countries, and co-occurrence analysis of all keywords was applied to show the main research trends in financial innovation field.

**Findings:** The most productive country is the USA. The most productive author is Oskooee, Mehdi Bahmani. The Journal of Banking Finance published the greater number of papers which is 29. The trends were specified using the clusters. So, business innovation, economic growth, fintech, corporate innovation and financial inclusion are popular trends in financial innovation development.

**Conclusions:** Financial innovation influence our daily life through financial sector, specifically banking sector and fintech products and services. Popularity increases in the fintech products and services, eco and green innovation that affect the company's performance and image. Developed countries have greater impact to promote this topic.

**Keywords:** financial innovation, fintech, financial technology, bibliometric study, Web of Science, VOSviewer, PRISMA.

#### **Introduction**

The research of financial innovation theme has started over two decades ago. The economist Joseph Schumpeter studied the term "innovation" in-depth and described it as the introduction of qualitative changes in existing products, processes, markets, input sources, and organizational structures (Arthur, 2014). Many researchers extended Schumpeter's description and connected it with the technological changes in the financial sector. Khraisha & Arthur provided the definition of financial innovation after conceptual review that quite clearly defined this term from all aspects: "Financial innovation is a process, carried out by any institution, that involves the creation, promotion and adoption of new (including both incremental and radical) products, platforms, and processes or an enabler of technologies that introduce new ways or changes to the way a financial activity is carried out" (Khraisha & Arthur, 2018). In particular, financial sector has been greatly affected by fintech development and influenced everyday activities of majority of people. This penetration into our life raises a great concern among scientists and researchers that leads to the greater number of publications.

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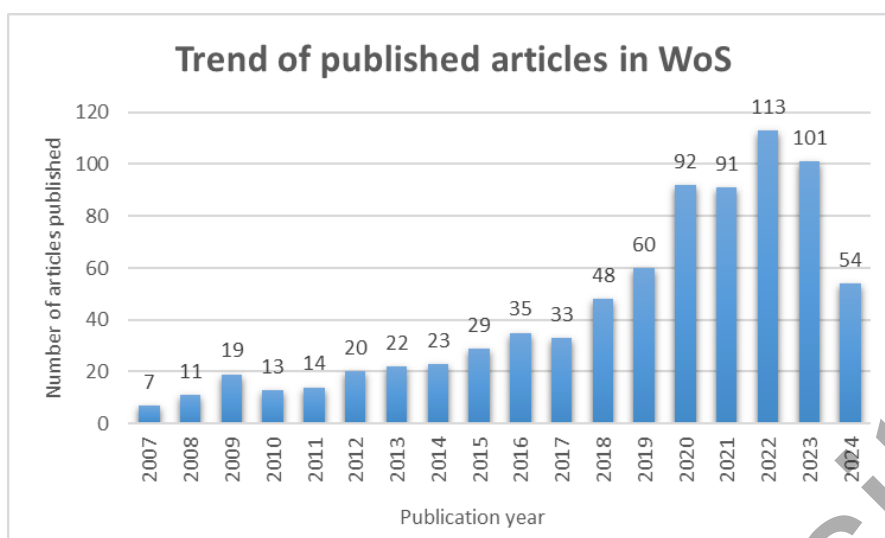


Figure 1. Trend of published articles in Web of Science

Note — complied by the authors based on the Web of Science data

Figure 1 shows the rising trend of articles published on financial innovation topic between 2007–2024 (September 21, 2024). The number of articles in 2019–2020 boosted due to Covid-19 which led to the development of fintech products and services during the country's lockdown.

In this study we focus on the following research questions:

RQ1: What documents, authors, countries, journals have greater contribution into the development of the financial innovation in the Web of Science Core Collection?

RQ2: What are the key scientific trends in financial innovation over the decades based on data from Web of Science Core Collection?

RQ3: What are the concerns of the most cited works in financial innovation field?

We attempt to answer these research questions using the extended publications in the Web of Science database using the modern visualization tools and share the results of this study in the financial innovation field.

The following sections are organized as below: Literature review section describes the development of financial innovation theme over the years and specific areas that were studied by the authors. Methods section provides information about the methods used and analysis conducted to answer the research questions. Results section describes the outcomes of the analysis. Discussion section explains the novelty of results, then Conclusion section summarizes overall the conducted analysis.

### **Literature review**

Bibliometric analyses were conducted by many authors on the topic of financial innovation.

Khraisha and Arthur (2018) emphasize that a theory of financial innovation has become the focus of interest after the financial crisis in 2008. The authors explore the possibility of developing a unified theory to explain financial innovation. It reviews the existing literature, identifying key complexities and diversities that challenge a general theory. They propose a meta-theory approach, suggesting that financial innovation is too varied to be captured by a single framework. Instead, they advocate for a set of interconnected theories — life cycle, evolutionary, economic, and institutional — that collectively explain the financial innovation process while accounting for its intricacies (Khraisha & Arthur, 2018).

Li and Xu (2022) conducted a comprehensive bibliometric study of financial innovation using the Web of Science database for the period of 1900–2020. They concluded that there were three peaks in number of publications as follows: 2009, 2015 and 2019. Financial innovation was involved in many areas, but especially in business economics and social science, so the most popular research topics are financial crisis, financial system, banking and so on. The USA is leader in citation numbers and China is a top at number of publications. The influential papers are focused on household analysis and consumer behavior study. Li and Xu underline the following as future research topics in financial innovation: COVID-19 and usage of other databases (Li & Xu, 2022).

Asif et al. (2023) in their paper used the Web of Science Core Collection (2015–2023) and found that 2021 was the year with the greatest number of publications. As well as Wang XC is the most productive au-

thor in FinTech innovation field. They could reveal the keywords used often than others, and they are: default risk, operational risk, money laundering, risk management, and so on. The most productive university is Southwestern University of Finance and Economics (China) with 15 articles published (Asif et al., 2024).

Financial innovation is an overarching term and such areas as Digital Lending, the Internet of Things, Robo Advisory and Supply Chain Finance still remain inadequately studied (Garg et al., 2023). Crowdfunding, mobile payment, peer-to-peer lending, and microfinance are hot topics to study in the fintech area due to smartphone popularity (Liu et al., 2020).

**Methods**

This article studied the financial innovation development over many years to see the trends, the most popular research papers, influential authors, popular journals and so on.

The data was derived from the Web of Science Core Collection database. Web of Science is one of the reliable and well-known resource to find the reviewed scientific articles. The search was constructed on the title “financial innovation” or all keywords such as “financial innovation” or “financial innovations”. 3,425 articles revealed as of September 21, 2024.

The data was analysed using the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021). The filter applied on Document types, Languages, Web of Science Categories and Citation Topics Meso. Selection criteria was focused on Economics, Business, Finance and Management areas. Figure 2 shows the steps used to identify 942 journal articles from the Web of Science Core Collection for our research.

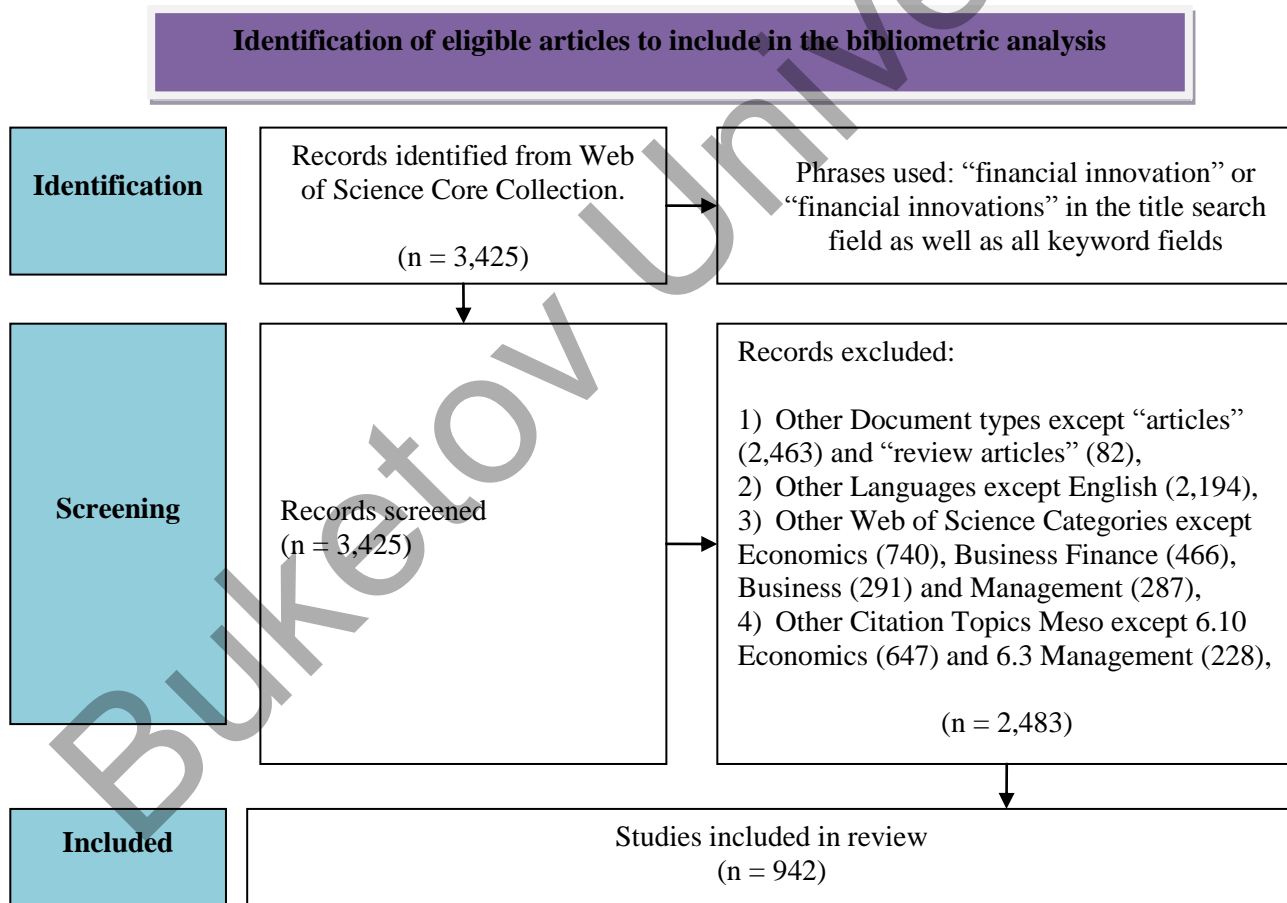


Figure 2. PRISMA flow diagram

Note — complied by the authors based on The PRISMA 2020 statement (Page et al., 2021)

The results of 942 journal articles are classified according to the Web of Science Categories as follows. See the Table 1:

Table 1

**Analysed articles by the Web of Science Categories**

Field: WoS Categories	Record Count	% of 942
Economics	500	53.079
Business Finance	351	37.261
Management	184	19.533
Business	167	17.728

Note — complied by the authors based on the Web of Science Categories

VOSviewer (Stopar & Bartol, 2019) is a visualization tool in the bibliometric study that offers to conduct co-authorship analysis of authors, organizations, countries; co-occurrence analysis of keywords; citation analysis of documents, sources, authors, organizations and countries; bibliographic coupling analysis of documents, sources, authors, organizations and countries; as well as co-citation analysis of cited references, sources and authors. In this study we use the co-occurrence analysis of keywords, and citation analysis of documents, authors and countries to identify the desired trends in financial innovation.

**Results**

The USA (251) is a top leader country that published more documents and has the biggest number of citations. The financial crises started in the United States in 2008 and consequently had its spillovers to other countries of the world, and it's one of the reasons why financial innovation became a hot research topic there. China (154) and the UK (93) are the second and third top countries with greater contribution. As the overlay visualization of VOSviewer software shows Asian countries such as China, Indonesia, Pakistan, Vietnam, Turkey, Saudi Arabia, Malaysia, Bangladesh and Jordan are currently focusing greater on financial innovation topic. However, European countries and the USA as the developed countries, have produced and are producing more publications. The most productive countries on number of papers and citation are given in the Table 2 below:

Table 2

**The most productive countries**

#	Countries	Documents	Citations
1	USA	251	9552
2	China	154	4862
3	UK	93	3360
4	Italy	47	969
5	France	45	1070
6	Germany	38	1418
7	Canada	36	848
8	Australia	33	707
9	Netherlands	27	1091
10	India	24	394

Note — complied by the authors using the Web of Science Core Collection database

The top 10 journals that published 19,22% of total articles related with financial innovation are The Journal of Banking Finance (29), The Journal of Financial Economics (23), Finance Research Letters (21), The Journal of Business Research (21), Review of Financial Studies (17), Applied Economics (16), Research Policy (15), The Journal of Economic Theory (14), Marketing and Management of Innovations (14), and Economic Modelling (11). Figure 3 shows the Publication titles treemap chart of 25 journal that published more articles.



Figure 3. Name of 25 journals that published more studies

Note — complied by the authors based on the Web of Science Core Collection database

The most cited 10 articles are given in the Web of Science Core Collection. 9 of 10 articles were published in economics and finance related journals and widely used keywords of these papers are innovation, financial performance, countries and firms, financial crisis, banking, and R&D. The publishers are Elsevier, Oxford University Press, American Marketing Association and Wiley (Table 3):

Table 3

The most cited 10 papers from the Web of Science

#	Authors	Article Title	Source Title	Author Keywords	Affiliations	Times Cited, WoS Core	Publisher	Publication Year
1	2	3	4	5	6	7	8	9
1	Hsu, P.H.; Tian, X.; Xu, Y.	Financial development and innovation: Cross-country evidence (Hsu et al., 2014)	Journal of Financial Economics	Financial development; Innovation; External finance dependence; High-tech intensiveness	University of Hong Kong; Indiana University System; Indiana University Bloomington; IU Kelley School of Business	907	Elsevier science sa	2014
2	Xie, X.M.; Huo, J.G.; Zou, H.L.	Green process innovation, green product innovation, and corporate financial performance: A content analysis method (Xie et al., 2019)	Journal of business research	Green process innovation; Green product innovation; Green subsidies; Green image; Content analysis	Shanghai University; Hong Kong Polytechnic University; Shanghai University	636	Elsevier science inc	2019
3	Kostopoulos, K.; Papalexandris, A.; Papachroni, M.; Ioannou, G.	Absorptive capacity, innovation, and financial performance (Kostopoulos et al., 2011)	Journal of business research	Absorptive capacity; Innovation; Financial performance; External knowledge inflows; Time-lagged measures	EADA Business School; Athens University of Economics & Business; Athens University of Economics & Business	442	ELSEVIER SCIENCE INC	2011

Continuation of Table 3								
1	2	3	4	5	6	7	8	9
4	Crotty, J.	Structural causes of the global financial crisis: a critical assessment of the “new financial architecture” (Crotty, 2009)	Cambridge journal of economics	Financial crisis; Causes of financial crisis; Global financial system; Financial deregulation; G20; G28; E44; E12	University of Massachusetts System; University of Massachusetts Amherst; University of Massachusetts System; University of Massachusetts Amherst	435	Oxford univ. press	2009
5	Sorescu, A.B.; Chandy, R.K.; Prabhu, J.C.	Sources and financial consequences of radical innovation: Insights from pharmaceuticals (Sorescu et al., 2003)	Journal of marketing		Texas A&M University System; Texas A&M University College Station; Mays Business School; University of Minnesota System; University of Minnesota Twin Cities; University of Cambridge	381	Amer marketing assoc.	2003
6	Caballero, R.J.; Krishnamurthy, A.	Collective risk management in a flight to quality episode (Caballero & Krishnamurthy, 2008)	Journal of finance		Massachusetts Institute of Technology (MIT); National Bureau of Economic Research; Northwestern University	309	Wiley	2008
7	Gennaioli, N.; Shleifer, A.; Vishny, R.	Neglected risks, financial innovation, and financial fragility (Gennaioli et al., 2012)	Journal of financial economics	Banks; Local thinking; Crisis	Harvard University; National Bureau of Economic Research; University of Chicago	292	Elsevier science sa.	2012
8	Acharya, V.; Xu, Z.X.	Financial dependence and innovation: The case of public versus private firms (Hsu et al., 2014)	Journal of financial economics	Private firms; Public firms; Innovation; R&D; Financial dependence	New York University; New York University; New York University Tandon School of Engineering	284	Elsevier science sa.	2017
9	Gorodnichenko, Y.; Schnitzer, M.	Financial constraints and innovation: why poor countries don't catch up (Gorodnichenko & Schnitzer, 2013)	Journal of the european economic association		University of California System; University of California Berkeley; University of Munich	259	Oxford univ. press	2013
10	Doh, S.; Kim, B.	Government support for SME innovations in the regional industries: The case of government financial support program in South Korea (Doh & Kim, 2014)	Research policy	Innovation; SMEs; R&D; Regional industries; Patent; Governmental financial support	Catholic University of Daegu; Andong National University	240	Elsevier	2014

Note — complied by the authors based on the Web of Science Core Collection database

The co-authorship analysis made by VOSViewer shows the authors who have minimum 2 articles and 10 citations. 84 authors met the threshold. There are 2 top authors are by number of papers, they are Oskooee, Mehdi Bahmani (5) and Citanna, A. (4). Other authors mainly have 2 articles. By citation the top 3

authors are Po-Hsuan Hsu (935 citations for 2 documents), Xie, Xuemei (710 citations for 2 documents) and Krishnamurthy Arvind (393 citations for 2 documents).

Po-Hsuan Hsu has H-index 21, total 33 publications, 2,482 citations including self-citation according to the Web of Science Core Collection metrics. He is registered in the University of Hong Kong. His subject categories defined as Business & Economics; Mathematical Methods in Social Sciences; Computer Science; Mathematics; Science & Technology — Other Topics. His highest cited article is called “Financial development and innovation: Cross-country evidence” (Hsu et al., 2014).

Xie, Xuemei has H-index 16, total 21 publications, 1,425 citations including self-citation according to the Web of Science Core Collection metrics. He is registered in Shanghai University. His subject areas include Business & Economics; Public Administration; Environmental Sciences & Ecology; Engineering; Social Sciences — Other Topics. His most cited paper is “Green process innovation, green product innovation, and corporate financial performance: A content analysis method” (Xie et al., 2019).

Krishnamurthy Arvind is the 3<sup>rd</sup> most cited author who has H-index 50, total 186 publications and 7,103 citing articles. He works at Stanford University and MIT. His research areas are Computer Science; Business & Economics; Telecommunications; Oncology and Engineering. His article in Business and Economics with 309 citation is “Collective risk management in a flight to quality episode” (Caballero & Krishnamurthy, 2008). Figure 4 illustrates overlay visualization of co-authorship analysis.

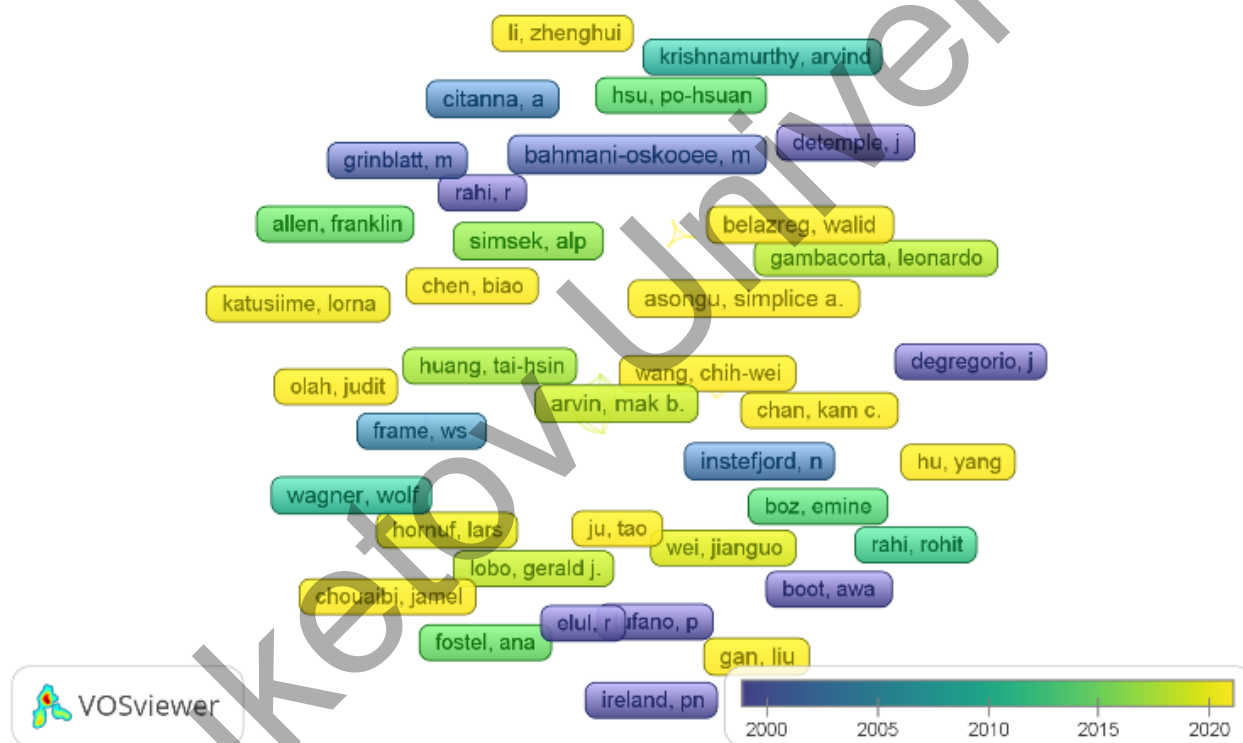


Figure 4. Overlay visualization of co-authorship analysis

Note — compiled by the authors based on the Web of Science Core Collection database using VOSviewer

The co-occurrence of keywords analysis was used to identify the financial innovation trends. The minimum number of occurrences of a keyword was 10, and 148 keywords met the threshold. The result revealed 5 clusters from the available dataset. The first cluster contains 38 words, cluster 2 — 35 words, cluster 3 — 33 words, cluster 4 — 23 words, cluster 5 — 19 words, respectively. The network map is given in Figure 6.

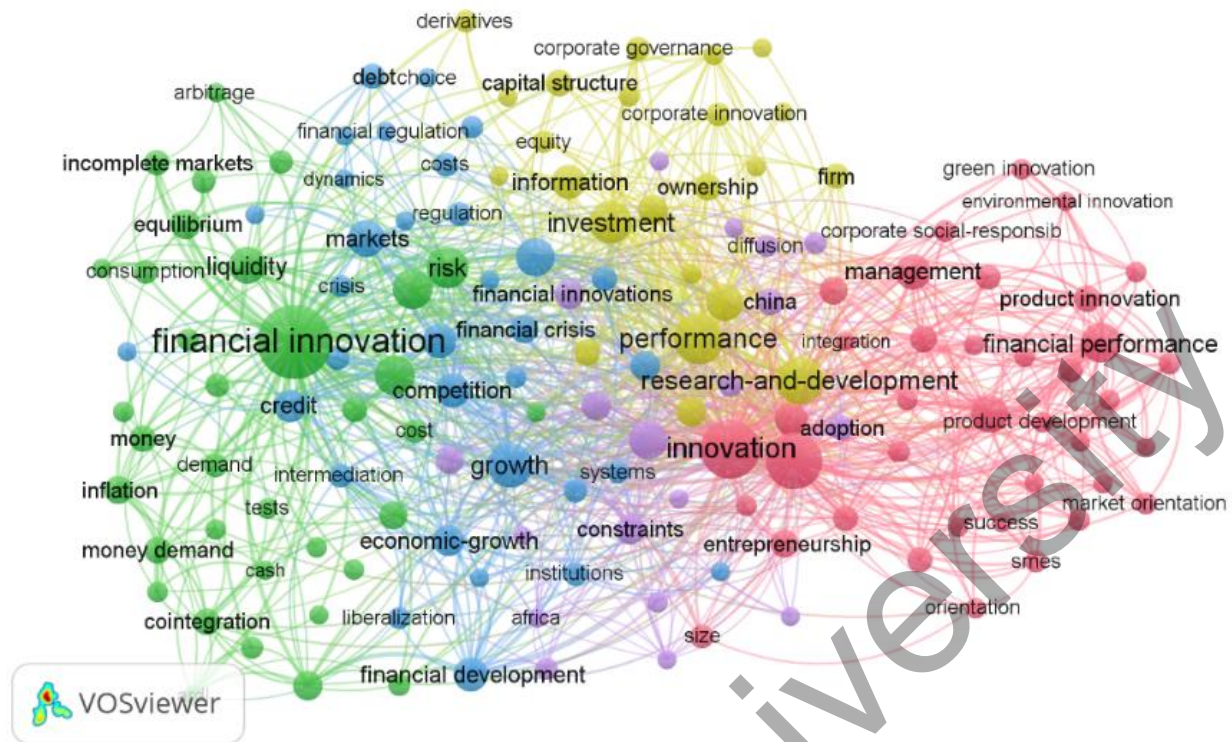


Figure 6. Co-occurrence analysis of all keywords

Note — compiled by the authors based on the Web of Science Core Collection database using VOSviewer

The first cluster is coded red in the network map where the main studies are innovation overall, impact, financial performance, firm performance, management, business, product innovation, competitive advantage and technology. So, this cluster is the basis of innovation and shows the relationship between technology development and business.

The second cluster is green and is focused on financial innovation. This cluster deals with financial innovation and economic growth, monetary policy, inflation, market, and risk. This body of research focuses on the articles that investigate the financial innovation development and countries' economic growth.

The third cluster is associated with the fintech, banking, growth, financial development, competition, and financial crisis. Current hot topics such as bitcoin, blockchain, regulation of financial technologies and risks in banking are the most common words for fintech industry.

The fourth cluster is coded yellow and comprises 23 items. It's the research stream of firm performance, investment, research and development, corporate governance, capital structure, financial constraints, and corporate innovation. This cluster illustrates that financial innovations have been also developing in the corporate and business areas.

The smallest cluster is coded purple and has 19 influential keywords such as financial inclusion, determinants, constraints, productivity, and adoption. China conducted more innovation related analysis about adoption and bank performance in banking. Africa focused on financial innovation and its impact on firms. UNCDF positioned financial inclusion as one of the 2030 Sustainable Development Goals that supports economic growth overall.

### Discussions

Financial innovation has a broad definition that covers different sectors of economy. The most cited paper — “Financial development and innovation: Cross-country evidence” by (Hsu et al., 2014) explores how financial market development influences technological innovation across countries. Nowadays banking industry is an attractive sector for financial innovation implementation with many challenges. Credit market is quite sensitive for innovation development due to high risk.

Another widely cited paper — “Absorptive capacity, innovation, and financial performance” by Kostopoulos, K.; Papalexandris, A.; Papachroni, M.; Ioannou, G. examines how firms use external knowledge to drive innovation and improve financial performance. The study emphasises the role of absorptive

capacity (ACAP) — a firm’s ability to identify, assimilate and apply external knowledge. It demonstrates that ACAP has a positive effect on innovation and indirectly improves financial performance over time. Using a sample of Greek firms, the authors of the study conclude that ACAP establishes a relationship between the inflow of external knowledge and innovation, while innovation subsequently improves financial performance indicators such as return on assets (ROA) and return on sales (ROS) (Kostopoulos et al., 2011). Implementation of innovation in the firm’s activity in different industries contributes to its revenue growth by cutting the expenses and costs. So, business area and financial sector are attractive for financial innovation development in the future. Consequently, this collaboration fosters also the economic growth overall.

Based on the clusters of the co-occurrence of keywords analysis the authors specified the following trends in financial innovation: business innovation, economic growth, fintech, corporate innovation and financial inclusion. Modern keywords as fintech, eco-innovation, green innovation, financial inclusion, bitcoin and corporate governance have been studying in many developed and developing countries.

### Conclusions

This research revealed that the USA is the most cited country and has 251 documents in the Web of Science database as of September 21, 2024. In addition, the USA is a productive country by the number of publications. The Journal of Banking Finance offered greater number of research articles (29) in the financial innovation topic. Three top cited authors are Po-Hsuan Hsu (935 citations), Xie, Xuemei (710 citations) and Krishnamurthy Arvind (393 citations).

Based on the most cited papers analysis, we may say that innovation is more peculiar for financial sector which fosters the economy of the country and for the activities of different companies which have an impact on environment, firm performance and service providers.

Financial innovation is the base for financial technology products and services development. Overlay visualization by keywords analysis shows that fintech, financial inclusion, corporate-social responsibility, corporate innovation, financial technology, green innovation, eco-innovation are currently hot topics to investigate. Financial sector and IT industry are closely related due to higher demand on fintech products and services, so it boosts the research and development in this sphere.

Well-developed markets provide better environment for innovation progress, and various risks arising in the credit market present vulnerabilities for the latest improvements.

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### **Қаржылық инновациялардың даму тенденцияларын библиометриялық зерттеу**

#### **Аңдатпа:**

**Мақсаты:** Мақаланың мақсаты VOSviewer бағдарламасымен Web of Science Core Collection деректеріне негіздеп библиометриялық әдіс көмегімен ең ықпалды авторларды, жарияланымдарды, елдерді, журналдарды және қаржылық инновациялардың дамуының негізгі тенденцияларын анықтау және талдау.

**Әдісі:** Сандық және сапалық әдістер қолданылды. PRISMA тәсілімен қаржылық инновациялар тақырыбында 942 мақала анықталды. Қаржылық инновациялар саласындағы негізгі зерттеу тенденцияларын анықтау үшін құжаттарға, авторларға және елдерге дәйексөздер келтіруді талдауды, сондай-ақ барлық кілт сөздердің бірлесіп пайда болуына талдау жасауды қамтитын ғылыми көрсетуге талдау пайдаланылды.

**Қорытынды:** Ең нәтижелі ел — АҚШ. Ең көп жазған автор — Oskooee, Mehdi Bahmani. «Journal of Banking Finance» журналы ең көп мақала (29) жариялаған. Тенденциялар кластерлер арқылы анықталды. Осылайша, бизнес-инновациялар, экономикалық өсу, финтех, корпоративтік инновациялар және қаржылық инклюзия қаржылық инновацияларды дамытудағы танымал үрдістер болып табылады.

**Тұжырымдама:** Қаржылық инновациялар біздің күнделікті өмірімізге қаржы секторы, атап айтқанда банк секторы және финтех өнімдер мен қызметтері арқылы әсер етеді. Финтех өнімдері мен қызметтерінің, экологиялық және «жасыл» инновациялардың танымалдығы артып келеді, бұл компанияның өнімділігі мен имиджіне әсер етеді. Дамыған елдер бұл тақырыптың өркендеуіне көбірек үлес қосады.

**Кілт сөздер:** қаржылық инновация, финтех, қаржылық технология, библиометриялық зерттеу, Web of Science, VOSviewer. PRISMA.

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### **Библиометрическое исследование тенденций развития финансовых инноваций**

#### **Аннотация:**

**Цель:** Целью данной статьи является выявление и анализ наиболее влиятельных авторов, публикаций, стран, журналов в области развития финансовых инноваций, а также ключевых тенденций в данной сфере с помощью библиометрического метода на основе данных Web of Science Core Collection с использованием программы VOSviewer.

**Методы:** В данной статье использовались количественный и качественный методы. С помощью подхода PRISMA было отобрано 942 статьи по теме финансовых инноваций. Для выявления основных исследовательских тенденций в области финансовых инноваций был применен анализ научного отображения, включающий анализ цитирования документов, авторов и стран, а также анализ совместного появления всех ключевых слов.

**Результаты:** Наиболее продуктивной страной является США. Самый продуктивный автор — Oskooee, Mehdi Bahmani. Журнал «Journal of Banking Finance» опубликовал наибольшее количество работ — 29. Тенденции были определены с помощью кластеров. Так, бизнес-инновации, экономический рост, финтех, корпоративные инновации и финансовая инклюзивность являются популярными тенденциями в развитии финансовых инноваций.

**Выводы:** Финансовые инновации влияют на нашу повседневную жизнь через финансовый сектор, а именно банковский сектор и финтехпродукты и услуги. Популярность финтехпродуктов и услуг, экологических и «зеленых» инноваций растет, что влияет на производительность и имидж компании. Развитые страны оказывают большее влияние на популяризацию этой темы.

**Ключевые слова:** финансовые инновации, финтех, финансовые технологии, библиометрическое исследование, Web of Science, VOSviewer. PRISMA.