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Research Article

A Bibliometric Analysis of Central Bank Digital Currencies (CBDCs)

Merkez Bankası Dijital Paraları (CBDC) Üzerine Bibliyometrik Bir Analiz

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Abstract

This study aims to reveal the fundamental structure of the academic literature on Central Bank Digital Currencies(CBDCs) by conducting a bibliometric analysis of the 343 publications. Using the keywords Central Bank Digital Currency and CBDC, studies published between 2018 and 2024 were obtained from the Web of Science database. The analysis and visualization processes were carried out using the VOSviewer. The findings indicate a remarkable increase in academic interest in CBDCs, with a concentration of publications originating from China, the United States, and European countries. Keyword co-occurrence and density analyses demonstrate that CBDCs constitute a multidisciplinary research domain that intersects not only with monetary innovation but also with areas such as blockchain, cybersecurity, data-privacy, and regulatory frameworks. Citation, author, and country network analyses reveal an increasingly integrated intellectual structure, a rise in international collaborations, and a deepening of research at a global scale. The study emphasizes the need to address CBDCs from technological, financial, and geopolitical perspectives. By highlighting thematic trends, conceptual gaps, and fundamental issues in the literature, it aims to provide a strategic perspective on the rise of digital currencies. This study seeks not only to contribute to academic discussions but also to benefit central banks, policymakers, market regulators and all relevant stakeholders.

Keywords: *Central Bank Digital Currency (CBDC), Web of Science (WoS), VOSviewer, Bibliometric Analysis, Financial Markets*

Öz

Bu çalışma, Merkez Bankası Dijital Paraları (CBDC) üzerine yapılan akademik literatürün temel yapısını ortaya koymayı amaçlamakta ve bu alandaki en çok atıf alan 343 yayının sistematik ve bilimsel bir bibliyometrik analizini gerçekleştirmektedir. Araştırma kapsamında Central Bank Digital Currency ve CBDC anahtar kelimeleri kullanılarak 2018–2024 yılları arasında yayımlanan çalışmalar taranmış; Web of Science veri tabanı, bibliyografik verilerin kaynağı olarak kullanılmış ve analiz ile görselleştirme işlemleri VOSviewer yazılımı ile yürütülmüştür. Bulgular, özellikle 2021 sonrasında CBDC'lere yönelik akademik ilgide dikkat çekici bir artış olduğunu ve bu artışın Çin, ABD ve Avrupa ülkelerinde yoğunlaştığını ortaya koymaktadır. Anahtar kelime eşzamanlılığı ve yoğunluk analizleri, CBDC'lerin yalnızca parasal bir yenilik değil; blokzincir, siber güvenlik, finansal kapsayıcılık, veri gizliliği ve düzenleyici çerçeveler gibi alanlarla kesişen çok disiplinli bir araştırma alanı olduğunu göstermektedir. Atıf, yazar ve ülke ağ analizleri ise entelektüel yapının giderek daha fazla bütünleştiğini, uluslararası iş birliklerinin arttığını ve küresel düzeyde araştırma derinliğinin arttığını ortaya koymaktadır. Çalışma, CBDC'lerin teknolojik, finansal ve jeopolitik boyutlarıyla birlikte ele alınması gerektiğine işaret ederken; literatürdeki tematik eğilimleri, kavramsal boşlukları ve temel meseleleri görünür kılmakta ve dijital para birimlerinin yükselişine yönelik stratejik bir bakış açısı sunarak yalnızca akademik literatüre değil,

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merkez bankalarına, politika yapıcılara, piyasa düzenleyicilerine ve ilgili tüm paydaşlara katkı sağlamayı hedeflemektedir.

Anahtar Kelimeler: *Merkez Bankası Dijital Parası (CBDC), Web of Science WoS), VOSviewer, Bibliyometrik Analiz, Finansal Piyasalar*

1.Introduction

As human needs continue to evolve rapidly, driven by innovations in financial markets and globalization, money itself has undergone profound transformations. Financial institutions have played a pioneering role in these changes. Beginning with financial products like electronic fund transfers, mobile banking, and credit cards, the trend has progressively limited the use of physical currency and promoted the adoption of electronic money. The COVID-19 pandemic during the period 2020–2022, along with associated restrictions, further accelerated the digitization of financial markets. Today, the transition has progressed from cryptocurrencies and stablecoins to software based instruments such as CBDCs, prompting the majority of central banks worldwide to initiate research and pilot projects related to CBDCs.

Digital money is defined as currency that, unlike fiat money, has no physical form but can be stored and transacted electronically. Digital currency systems may operate on either centralized platforms or decentralized, distributed architectures. In centralized systems, a single authority or financial institution verifies and governs transactions, whereas in decentralized systems, transactions are executed across a network using cryptographic consensus mechanisms supported by distributed ledger technology (DLT). CBDCs represent the digital, non-physical form of fiat currency issued by a central bank. They exist solely in digital format and can serve as legal tender at any location that accepts them, typically through electronic wallets. This allows transactions to be conducted more quickly, securely, and at lower cost. CBDCs can be implemented utilizing diverse technological architectures and always represent the digital form of the issuing country's legal tender.

The rapid development of CBDCs offers numerous advantages to financial markets, including reduced transaction costs, improved financial accessibility, and enhanced effectiveness and speed of payment systems. As secure, state backed digital alternatives, CBDCs can extend the reach of formal economic participation to unbanked individuals. Moreover, CBDCs can facilitate real time settlement in both domestic and cross-border transactions, minimize counterparty risk, and reduce dependence on expensive intermediaries. These advances also support greater transparency and traceability of financial flows, supporting anti money laundering and counter terrorism financing initiatives. Additionally, the programmability of CBDCs allows for the automation of complex financial transactions, such as conditional transfers and smart contracts, thereby further enhancing market efficiency. In this respect, CBDCs are viewed not only as instruments of monetary innovation, but also as structural drivers of improved functionality and resilience within financial systems.

However, alongside these benefits, CBDCs also present several significant disadvantages for financial markets. First, their issuance directly by central banks might weaken the intermediation role of commercial banks, causing disruption within the banking sector. This shift of deposits to central banks could reduce the lending capacity of commercial banks and raise concerns regarding a potential credit crunch. Moreover, widespread adoption of CBDCs complicates liquidity management in the financial system and may trigger new forms of systemic risk, such as bank runs, particularly during periods of stress. Privacy and security concerns are also salient, as CBDCs might enable central authorities to monitor detailed transaction data. Given that CBDCs entail both strengths and drawbacks, it is essential to conduct rigorous cost and benefit analyses during the design and implementation stages and to manage potential risks with care.

This study aims to provide a extensive bibliometric analysis of the scholarly literature on CBDCs. By identifying the most frequently cited publications, examining the contributions of prominent authors, and analyzing the temporal distribution of research output within a selected academic database, the study aims to map the intellectual structure and evolving trends in the field. The findings are expected to enhance the understanding of the current research landscape, highlight influential works and emerging themes, and offer valuable insights that may inform and guide future academic and policy oriented research on CBDCs.

2. Conceptual Framework

2.1. Central Bank Digital Currencies (CBDCs)

CBDCs are defined as digital fiat currencies issued and regulated by a country's central bank. They represent the central authority's direct liability to the public (BIS, 2020). Unlike decentralized cryptocurrencies such as Bitcoin, CBDCs are issued centrally and aim to combine the advantages of digital payment technologies with the reliability and stability of sovereign monetary systems. CBDCs are primarily divided into two types; retail CBDCs, designed for the general public to use as a digital equivalent of cash, and wholesale CBDCs, limited to financial institutions for interbank payments and large-value transactions (Kosse and Mattei, 2022). Retail CBDCs can enhance financial inclusion, reduce cash transaction costs, and improve payment system efficiency, particularly in regions with underdeveloped banking infrastructure. On the other hand, wholesale CBDCs can increase the speed, security, and transparency of cross-border and domestic financial transactions (Auer and Böhme, 2021). The design and implementation of CBDCs vary across jurisdictions due to different countries exploring account based or token based models and offering varying levels of privacy, programmability, and interoperability. As central banks continue to research and pilot CBDCs, their potential to reshape the global monetary policy landscape is growing.

The historical development of CBDCs reflects a gradual yet significant evolution driven by technological innovation and changes in monetary policy frameworks. The first known prototype of a CBDC emerged in 1993, when the Bank of Finland introduced the Smart Card as an electronic cash form designed for payment and settlement systems (Aleksi 2020; Todd and Rogers 2020). In contrast to this early centralized initiative, the first decentralized digital currency to operate outside the authority of central banks and centralized financial (CeFi) systems was Bitcoin, introduced in a white paper published by Nakamoto in 2008, Bitcoin: A Peer-to-Peer Electronic Cash System (Nakamoto, 2008). Bitcoin presented a strong alternative for electronic payments and settlements without the need for third-party intermediaries. Its development laid the groundwork for what later became known as decentralized finance (DeFi), leveraging cryptographic techniques in what is now commonly referred to as distributed ledger technology (DLT). Over time, this technology gained prominence under the term blockchain. The emergence and rapid expansion of DLT based cryptocurrencies have significantly influenced and accelerated the development of CBDCs, as central banks worldwide began to explore digital alternatives to traditional fiat currencies within a secure, programmable, and efficient digital infrastructure. In 2014, Ecuador became the first central bank to announce and launch a digital currency, Dinero Electrónico, designed to facilitate mobile payments (Yermack, 2017). The same year, the People's Bank of China (PBOC) initiated its Digital Currency Electronic Payment (DC/EP) project to develop a digital renminbi or digital yuan (Auer et al., 2020).

Further developments occurred in 2015 when the Bank of England published insights on possible implementations of CBDCs under negative interest rate regimes (Broadbent, 2016). In 2016, the Bank of England formally introduced the term CBDC in a research paper, and the Swedish central bank proposed the e-krona concept (Sveriges Riksbank, 2016). The Central Bank of Uruguay started a pilot program in 2017 to test the digital Uruguayan pesos (Sarmiento, 2022), and the PBOC established a dedicated team to explore modern CBDC infrastructure (PBC,2021). Institutional implementations followed; in 2019, the Eastern Caribbean Central Bank (ECCB) launched the Digital Eastern Caribbean Dollar (DXCD), a pilot CBDC project targeting multiple Caribbean nations (ECCB, 2019). And the Bahamas became the first country to officially introduce a CBDC nationwide with the release of the Sand Dollar (Central Bank of the Bahamas, 2019). The COVID-19 pandemic in 2020 accelerated global interest in digital currencies, prompting institutions such as the U.S. Federal Reserve, the Bank of Canada, and the European Central Bank (ECB) to actively pursue CBDC exploration (Auer et al., 2021). In 2021, the U.S. government launched its digital dollar project through official channels (Accenture, 2020), and the Indian government proposed legislation to enable the Reserve Bank of India (RBI) to issue a CBDC (Kar and Priyadarshini, 2021). Simultaneously, China continued testing its digital yuan infrastructure (Morgan and Fullerton, 2022). By 2022, the ECCB had completed the pilot phase of the DXCD and announced phased rollout plans (ECCB, 2023). In December 2022, India officially launched the Digital Rupee, marking a key development in the CBDC area (RBI, 2022). South Korea’s Bank of Korea (BOK) advanced its two phase CBDC pilot, experimenting with both wholesale settlement and

cross border functionalities (Bank of Korea, 2022). In the United Arab Emirates, Project Aber, a cross border CBDC initiative with Saudi Arabia, paved the way for domestic digital dirham preparations (CBUAE, 2022). By 2023, Russia's Central Bank launched the consumer pilot of its digital ruble in August, involving real transactions between banks and users (Bank of Russia, 2023). The Swiss National Bank (SNB) began testing wholesale CBDCs for tokenized asset settlements under Project Helvetia III (SNB, 2023). And Singapore initiated a live wholesale CBDC pilot under Project Orchid, building upon earlier cross-border experiments through Ubin+ (MAS, 2023). In 2024, Brazil officially launched its DREX pilot to the public, with broader functionality across payment ecosystems (Banco Central do Brasil, 2024). Meanwhile, Sweden completed technical evaluations of the offline capable e-krona, affirming its potential as a national complement to cash (Sveriges Riksbank, 2024).

Accelerating developments and experiences with CBDCs in major economies highlight the growing strategic importance of CBDCs in reshaping modern financial ecosystems. CBDCs promise to strengthen monetary sovereignty, enhance the efficiency of payment systems, and provide a state backed digital alternative to private cryptocurrencies and stablecoins (Auer and Böhme, 2021). As financial markets undergo digital transformation, CBDCs are seen as a tool to mitigate risks associated with unregulated digital assets and facilitate programmable money in potential applications such as financial transfers, tax collection, and anti money laundering compliance (BIS, 2021). Additionally, the issuance of wholesale CBDCs aims to increase the speed of interbank payments, reduce transaction costs by decreasing reliance on intermediaries, and strengthen cross border financial integration (Bech and Garratt, 2017). In the context of geopolitical shifts and evolving payment infrastructure environments, central banks in countries such as China, India, and Russia have highlighted CBDCs as a mechanism to reduce dependence on the US dollar and the SWIFT network, further emphasizing their strategic importance (Zhang, 2023).

As a result, CBDCs are no longer merely experimental innovations but are rapidly establishing themselves as fundamental tools in the architecture of future monetary and financial systems within financial markets.

The evolution of CBDCs, especially since 2020, has begun to attract increasing interest in academic circles as central banks all over the world have moved from exploratory research to pilot applications. Academic interest has grown in parallel with policy experiences, leading to an increase in academic publications analyzing the economic, technological, legal, geopolitical dimensions of CBDCs (Auer et.al., 2020). The multidisciplinary nature of CBDC research, which encompasses monetary economics, information systems, and international relations, has played a significant role in the development of a structured and growing body of literature. This development underscores that CBDCs are not merely technical innovations but transformative tools deserving of critical academic research and global policy attention.

2.2. Literature Review

A review of the literature on CBDC reveals a rapid growth in related studies, especially after the pandemic period. Among these Allen et.al. (2022), with 137 citations. The study reviews research related to fintech, central bank digital currencies, central bank digital currencies, CBDCs, cryptocurrencies, stablecoins and, focusing on recent progress in payments, digital banking, fintech lending, and CBDC pilot programs (e-CNY) to provide insight into China's experiences in the fintech field.

Fernández-Villaverde et.al. (2021) argue that while a CBDC could replicate the outcomes of private financial intermediation under normal conditions, it offers greater stability during banking panics by deterring runs through rigid contracts with investment banks. As a result, the central bank may attract all deposits, potentially becoming a deposit monopolist and threatening the traditional role of maturity transformation in commercial banking.

Brunnermeier and Niepelt (2019) develop a general model to identify conditions under which swapping private money for public Money, such as through CBDCs, does not alter equilibrium allocations or prices. It finds that, under certain conditions, introducing a CBDC with central bank pass-through funding can avoid triggering a credit crunch or compromising financial stability.

Barrdear and Kumhof (2022) use a Dynamic Stochastic General Equilibrium (DSGE) model showing that issuing a CBDC equivalent to 30% of GDP could permanently increase GDP by 3%, primarily by reducing real interest rates, taxes, and transaction costs. Additionally, a countercyclical CBDC policy could enhance monetary policy effectiveness without significantly harming the banking sector if properly designed.

Agur et al. (2022) examine how the design of CBDCs is influenced by users' preferences for anonymity and security and how network effects influence payment choices. It finds that an interest bearing CBDC can balance the trade off between preserving bank credit and ensuring diversity in payment methods, especially when network effects are significant.

Wang et.al. (2022) introduce two novel indices, the CBDC Uncertainty Index (CBDCUI) and CBDC Attention Index (CBDCAI), based on over 660 million news articles, it examines media-focused dynamics related to CBDC developments between 2015 and 2021. The findings reveal that financial markets respond more strongly to CBDC related uncertainty than attention, with significant implications for investors, policymakers, and regulators navigating the digital currency landscape.

Li et.al. (2022) construct a novel CBDC signal index to examine how the fintech sector responds to central bank announcements related to digital currencies. It finds that while fintech firms initially react positively to CBDC signals, their responsiveness weakens over time, with notable reactions still occurring around key symbolic events.

Davoodalhosseini (2022) explores optimal monetary policy under different payment regimes and finds that if the price of using CBDC is lower, it can be more efficient than cash, potentially achieving the first best allocation. Simulations suggest that introducing a CBDC could modestly increase consumption in the U.S. and Canada, though coexistence with cash may reduce overall welfare compared to using either instrument alone.

Minesso et.al. (2022) develop a two country DSGE model to examine the international effects of CBDC issuance, showing that CBDCs amplify cross border shock transmission and economic linkages. It finds that the design of a CBDC is critical, as unilateral issuance can create monetary asymmetries, reducing policy autonomy and welfare in other countries.

Lee et.al. (2021) explore optimal CBDC design by balancing benefits and risks, highlighting global best practices and using China’s two tier system as a test case. In conclusion, CBDCs will be central to the future digital economy, and successful adoption requires adaptable regulation, technological readiness, and strategic implementation to avoid over-centralization.

Zhang and Huang (2022) review the functional and nonfunctional requirements of CBDC design and evaluates various blockchain based approaches, concluding that permissioned blockchains are more suitable for CBDCs than permissionless ones. It also highlights key challenges, such as scalability, performance, and cross chain interoperability, and offers guidance for future blockchain based CBDC implementations.

Bhaskar et.al. (2022) use bibliometric and content analysis of 174 Scopus indexed publications to map publication trends, key themes, and intellectual structures in CBDC research since 2018. It highlights growing academic interest in CBDCs as a transformative force in monetary digitization, while identifying gaps in theory, context, and methodology that future research should address.

Ozili, P.K. (2023) systematically reviews recent CBDC research, highlighting consensus around CBDCs being central bank liabilities with cash like features and noting key motivations such as financial inclusion and improved monetary policy. While acknowledging CBDC's potential benefits, it also emphasizes design limitations and calls for further empirical studies and country specific research to address unresolved challenges and competing policy goals.

Auer et.al. (2022) highlight the rapid growth of CBDC related research, emphasizing both microeconomic issues such as technological design and privacy, and macroeconomic consequences for financial stabilisation and monetary policy. This highlights the need for further research, especially regarding cross border CBDC challenges and their role in the broader digital economy.

The reviewed literature reveals that CBDCs have emerged as a transformative concept where monetary policy intersects with financial stability, and digital innovation. While many studies emphasize the potential benefits of CBDCs, such as enhancing payment efficiency, financial inclusion, and monetary policy effectiveness, there is also growing recognition of their risks, including disintermediation, privacy concerns, and cross-border spillovers. Research highlights the importance of careful CBDC design, particularly in relation to technology architecture, institutional frameworks, and user adoption dynamics.

3. Methods

3.1. Research Objective and Limitations

This study aims to uncover the fundamental structure of the academic literature on CBDCs by conducting a systematic and scientific bibliometric analysis of the 343 most cited publications in this field. To achieve this objective, the research provides insights into the financial, intellectual, conceptual, and social structure of CBDC-related academic studies through a content based, temporal, and relational examination of highly cited works. The methodology comprises several key stages, including research design, data collection, implementation, and interpretation of findings.

The study seeks to answer a series of research questions, such as; what is the numerical distribution of publications by year, and in which years is publication density highest? What is the distribution of publications by country, and which languages are predominantly used? What types of publications constitute the literature? In which categories are these publications classified within the field? What are the most frequently cited topics and keywords? How are the relationships among keywords spatially distributed, how have they evolved over time, and which keywords show the highest concentration? What are the ten most cited articles, who authored them, what keywords do they include, and how many citations have they received? Additionally, what does the citation network among the most influential authors in the field look like? How are citation networks formed at the country level, and what are the patterns in the co-citation network of frequently referenced authors?

By analyzing the most highly cited studies in the field through bibliometric methods, this research seeks to contribute to the current literature on CBDCs. The study is expected to provide guidance for researchers and policymakers by mapping the current landscape and intellectual structure of CBDC related academic output.

The limitations of the study involve the use of only the Web of Science database for data and only VOSviewer software for visualization and analysis. Future studies could offer a different perspective by using different databases and visualization programs. The study uses data from 2018 to 2024. The study could be reanalyzed once 2025 is complete. Additionally, the study focused solely on the CBDC concept. Therefore, future studies should be expanded to include the elements that constitute the CBDC concept, which will enable the results to be further detailed.

3.2. Research Methodology

In this study, bibliometric analysis was adopted as the primary methodological approach, as it enables the systematic and quantitative examination of scientific literature. Bibliometric analysis involves the statistical assessment of scientific publications produced within a specific subject area, time frame, and geographical region by individuals or institutions, as well as the relationships among these publications (Lawani, 1981). The approach is also known as science mapping and is using to analyze both broad areas of interest and more specific topics. This approach is also recognized as science mapping and is utilized to examine both broad and more specific areas of interest (Dima, 2022).

The purpose of bibliometric analysis is as follows; to identify and validate thematic clusters and reveal the networks of journals and authors that define the field (Block et al., 2020). This method allows for the analysis of academic output based on various variables such as authorship, keywords, citations, researcher profiles, publication years, languages, geographical distribution, document types, Web of Science categories and indexes, research domains, and institutional affiliations.

Bibliometric analysis aims to identify patterns, trends, and relationships within scientific literature by utilizing metric data derived from published articles. Through indicators such as publication counts, citation analyses, co-authorship networks, keyword co-occurrence analyses, and visual mapping

techniques, it becomes possible to reveal the structure and dynamics of scholarly communication. This approach is widely used to evaluate scientific research performance, identify emerging research trends, and understand collaboration patterns across different research domains, characterize research, and quantify them.

3.3. Data Collection (Bibliographic Dataset)

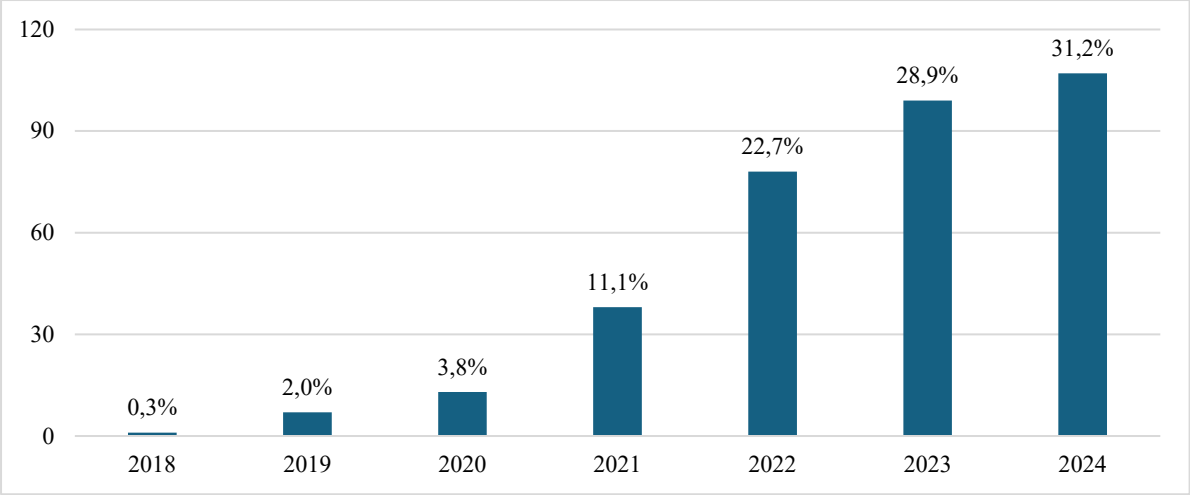
The Web of Science database was chosen as the primary source of data due to its authoritative status among academic indexing platforms, particularly in the field of social sciences. This database not only includes peer reviewed journal articles but also encompasses proceedings from international conferences, congresses, symposia, workshops, seminars and thereby enhancing both the depth and breadth of the dataset (Martinez et al., 2015). Moreover, Web of Science is recognized as the most widely used, reputable, and one of the oldest databases for citations and academic publications. It is also frequently utilized in bibliometric analyses (Birkle et al., 2020).

The database search was conducted using the keywords Central Bank Digital Currency and CBDC within the subject field, and the publication years were limited to the period between 2018 and 2024. Bibliographic data were retrieved from the Web of in an unformatted textual structure and imported into the VOSviewer software for visualization and analysis. VOSviewer is an open source bibliometric analysis program. In addition, the built in analytical tools of the Web of Science platform were also utilized in this study.

4. Data Analysis and Findings

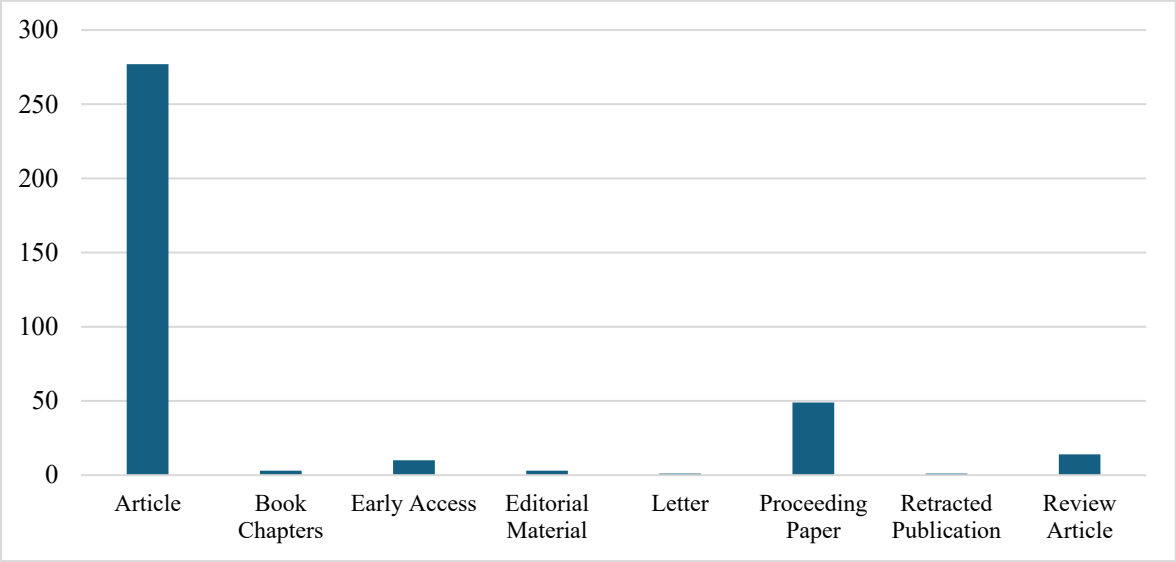
Based on the analysis of 343 articles published between 2018 and 2024, using the Web of Science database and the VOSviewer application, the year 2024 stands out as the most prolific year, with a total of 107 publications. The findings indicate that the majority of the studies have been conducted after 2021, contributing significantly to the growth of the literature, with a total of 2084 citations recorded. The number of publications increased markedly from just 1 in 2018 to 107 in 2024, reflecting a rising academic interest in the topic over time. Graph 1 illustrates the annual number and percentage of publications during the study period.

Graph 1. Distribution of Publications on CBDCs by Year



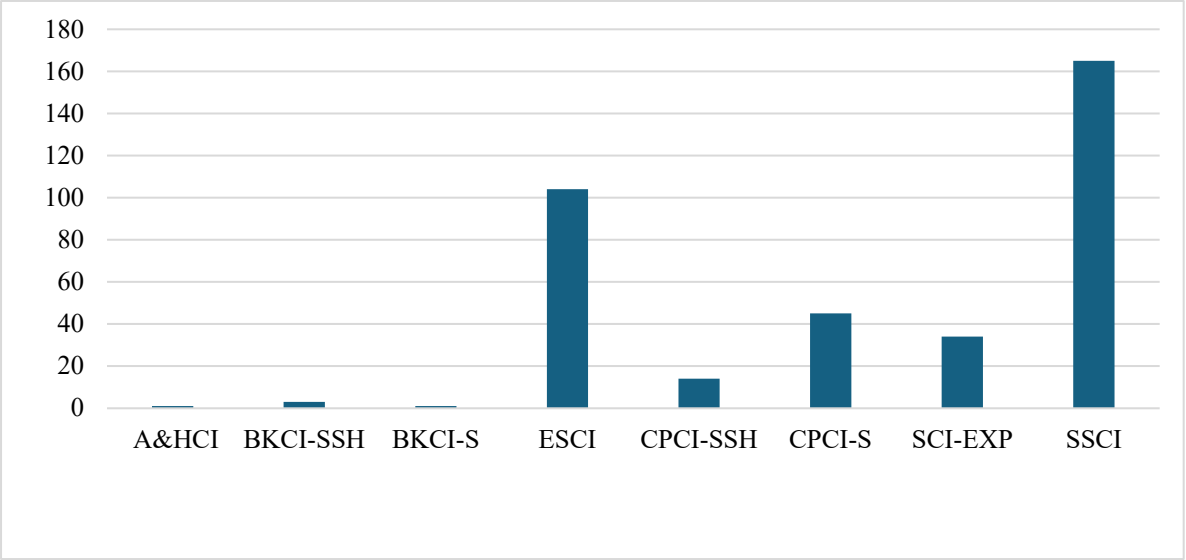
When examined in terms of document type, 77% of the data set consists of articles and 13.7% consists of proceeding papers. Graph 2 shows the distribution of publications types.

Graph 2. Distribution of Publications on CBDCs by Types



In terms of country level analysis, China leads with 58 publications, followed by the United States with 47, England with 46, Germany with 32, South Korea with 23, Russia with 21, and Italy with 20 publications. Furthermore, 330 of the publications were published in English, confirming the dominance of English as the primary language of academic communication in this field. Additionally, the total of 343 publications were authored by 802 unique contributors. The number of publications per author varies between a minimum of 1 and a maximum of 5, indicating a relatively broad distribution of authorship within the dataset.

Graph 3. Distribution of Publications Related to CBDCs According to The Web of Science Index



An analysis of the publications based on their indexing within the Web of Science reveals that 45% are indexed in the Social Sciences Citation Index (SSCI), while 28.3% are included in the Emerging Sources Citation Index (ESCI). Graph 3 represents the distribution of publications based on their indexing types.

An examination of the distribution of publications across the top ten Web of Science categories reveals that Economics and Business Finance clearly dominate the list, occupying the first two positions by a significant margin. These are followed by publications categorized under Computer Science. Table 1 represents the distribution of publications based on their Web of Science categories.

Table 1. Distribution of Publications Related to CBDCs According to the Top 10 Categories of Web of Science

Web of Science Categories	Record Count
Economics	123
Business Finance	107
Computer Science Information Systems	38
Computer Science Interdisciplinary Applications	30
Computer Science Theory Methods	26
Law	25
Business	23
Telecommunications	17
International Relations	13
Management	13

A micro level analysis of the publications based on citation topics indicates that Blockchain ranks first, with 225 publications addressing this subject. This is followed by the topic of Monetary Policy. Table 2 provides detailed information on the distribution of publications according to the top 10 citation topics.

Table 2. Distribution of the Top 10 Citation Topics in Publications Related to CBDCs

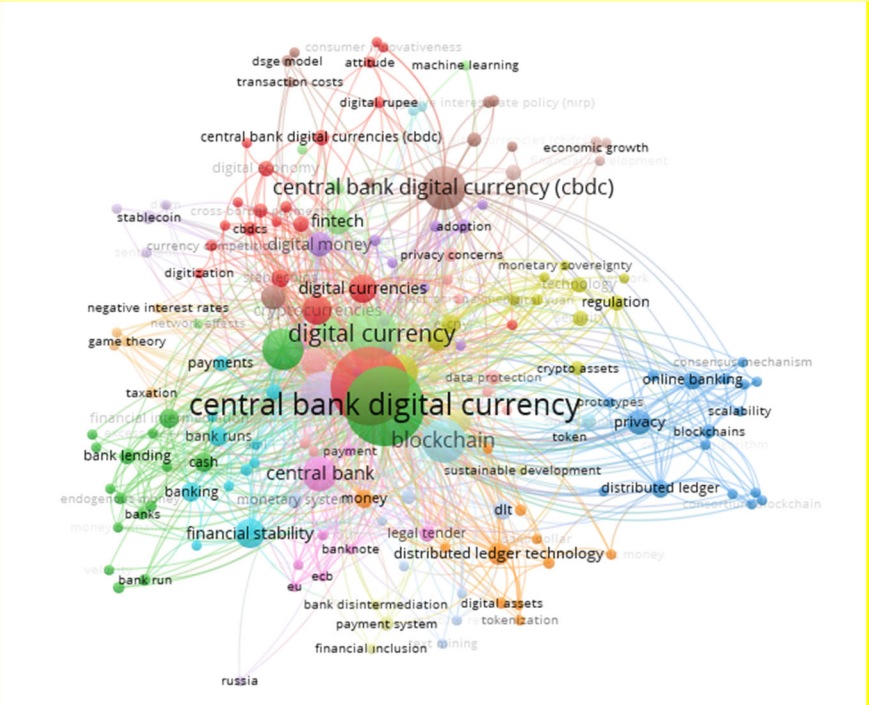
Citation Topics	Count
4.187.2766 Blockchain	225
6.10.22 Monetary Policy	35
6.3.368 Technology Acceptance Model	14
6.10.80 Market Interdependencies	11
6.10.82 Finance-growth Nexus	10
6.185.1644 Digital Privacy	10
4.187.160 Cryptographic Protocols	4
4.61.1820 Credit Scoring	3
6.10.63 Corporate Governance	2
6.122.1234 Economic Thought Evolution	2

In addition, the 343 publications analyzed between 2018 and 2024 were cited in a total of 1,467 articles. Among these, 36.2% are related to the topic of blockchain, 11.3% to market interdependencies, 6.8% to the finance and growth nexus, and 5.8% to monetary policy. The publications have received a total of 4,012 citations, resulting in an average of 11.7 citations per publication. The year 2024, which also recorded the highest number of publications, 107, witnessed the greatest citation activity, with a total of 1,642 citations.

In order to better understanding the structural composition of the academic literature on CBDCs, a keyword co-occurrence analysis was conducted using VOSviewer software. The analysis was based on 343 keywords that co-occurred at least twice across the selected publications. This threshold was set to

ensure conceptual relevance while maintaining a manageable network size. As a result, the analysis identified 2028 keyword co-occurrences, forming 1298 links and 17 distinct clusters.

Figure 1. Visualization of Relationships Between Keywords in Publications Related to CBDCs



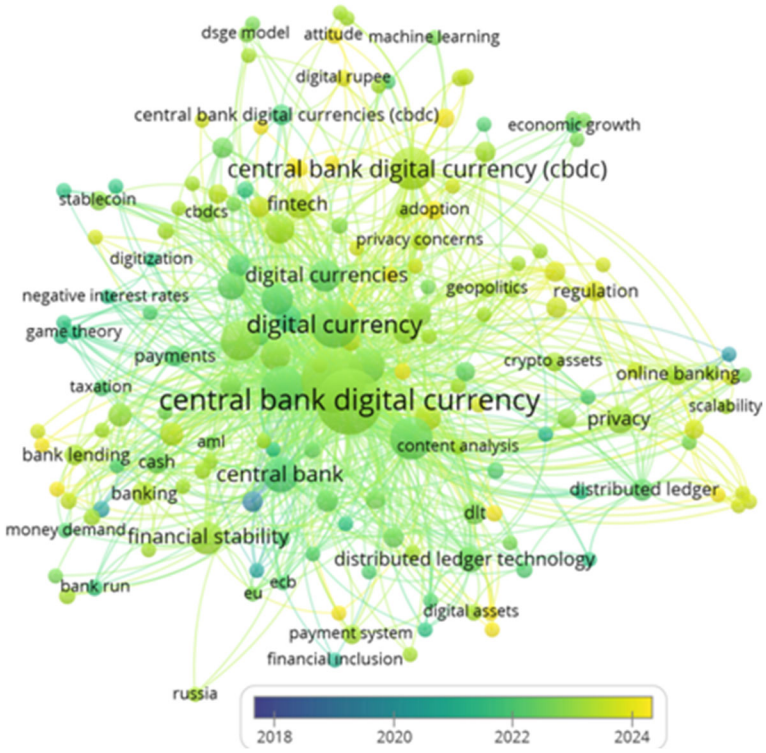
Source: VOSviewer, (2025)

The network visualization in Figure 1 illustrates the spatial pattern and intensity of relationships among frequently co-occurring keywords. In addition, the most important terms at the network's center include central bank digital currency, CBDC and central bank digital currency (CBDC), unsurprisingly representing the dominant thematic focus across the literature. These central nodes act as semantic anchors to which various thematic clusters are attached. Keywords most strongly associated with the central concepts include blockchain, cryptocurrencies, online banking, digital payments, digital assets, digital currency, fintech, financial inclusion, security, central bank, monetary policy, financial stability, cash, financial regulation, data privacy and network security. These terms reflect both the technical and institutional dimensions of the CBDC debate, as well as its societal and regulatory implications.

Moreover, further examination of keyword clusters reveals the growing importance of computer science related terminology in CBDC research. Terms such as blockchain technology, fintech, security, and privacy frequently co-occur with CBDC related keywords, highlighting a technical subdomain that focuses on implementation, data protection, and infrastructure design. These findings suggest that CBDC research is not only rooted in monetary economics but also increasingly embedded within interdisciplinary frameworks involving information technology, data governance, and cybersecurity. The emergence of 17 distinct clusters in the co-occurrence network indicates a rich and multifaceted research field. Each cluster represents a thematic area such as monetary policy, technological infrastructure, financial intermediation, regulatory compliance, or social inclusion. The interconnectedness among these clusters also suggests that CBDC research transcends disciplinary boundaries, promoting dialogue among economists, technologists, policy makers, and legal scholars.

The keyword co-occurrence analysis reveals that the CBDC literature is anchored around a core set of technological and financial concepts. The prevalence of terms such as blockchain, fintech, and regulatory compliance underlines the dual nature of CBDCs as both a monetary instrument and a digital innovation. As the area continues to develop, the dense network of co-occurring concepts suggests a growing convergence of digital finance, regulatory studies, and technical design principles in the academic treatment of CBDCs.

Figure 2. Visualization of the Relationships Between Keywords in Publications Related to CBDCs by Year



Source: VOSviewer, (2025)

The figure illustrates a network analysis of keywords associated with publications on CBDCs, capturing the evolution of thematic focus between 2018 and 2024. Each node shows a keyword, and the links denote co-occurrence relationships between them in scholarly literature. The color gradient, ranging from blue, earlier years, around 2018, to yellow, recent years, up to 2024, indicates the temporal emergence and prominence of specific themes. Additionally, 17 distinct clusters are identified, representing thematic groupings within the broader discourse.

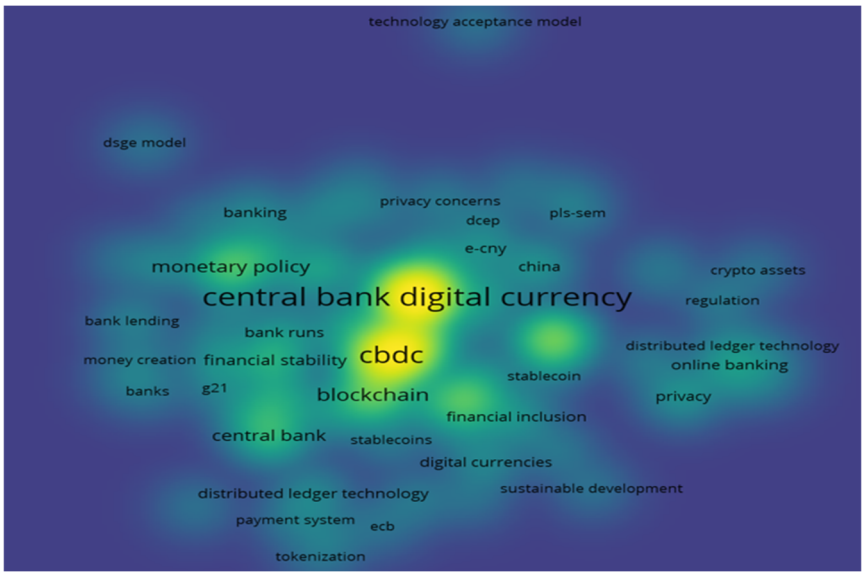
The temporal progression of keywords within the CBDC related literature reveals a dynamic shift in scholarly attention from foundational to emergent topics over the period between 2018 and 2024. In the earlier phase, 2018 and 2019, research predominantly focused on core concepts such as digital currency, central bank, financial stability, and digitization, reflecting initial explorations of the digital transformation of monetary systems. As the field matured during 2020–2022, the focus expanded to encompass more technical and policy-oriented issues, including distributed ledger technology, cryptocurrencies, financial inclusion, and regulatory frameworks. These developments suggest increasing engagement from central banks and policymakers, driven by real-world experimentation and pilot programs. In recent years, specifically in 2023 and 2024, the discourse has further evolved to include complex and forward-looking concerns, such as privacy, scalability, machine learning, and user adoption. Emerging keywords like digital rupee, privacy concerns, and content analysis indicate both methodological diversification and the growing geographical expansion of CBDC related initiatives, especially in emerging and developing economies.

The network visualization identifies 17 distinct thematic clusters, each representing a coherent subdomain within the broader discourse on CBDCs. At the center of the network is a core cluster focused on fundamental terms such as central bank digital currency, digital currencies, and central bank, reflecting the primary conceptual and definitional focus of the literature. Surrounding this core are interconnected clusters that illustrate the field's multidimensional character. These include a technology focused cluster addressing distributed ledger technology, blockchain, and digital assets; a regulatory cluster involving privacy, regulation, and taxation; and an economic impact cluster emphasizing financial stability and economic growth. Additional clusters capture evolving research interests such as

public attitudes and adoption (machine learning, attitude, adoption), financial access (financial inclusion, payment systems), and geopolitical dynamics (geopolitics, Russia, digital Rupee). The network structure underscores the interdisciplinary nature of CBDC research, incorporating insights from economics, computer science, law, and behavioral studies. This clustering also reflects the field's transition from a relatively narrow focus to a more broader and integrated research agenda.

Figure 3 shows the density map of keywords. Accordingly, the following keywords such as monetary policy, blockchain, central bank are extensively used in studies.

Figure 3. Density of Relationships Between Keywords in Publications Related to CBDCs



Source: VOSviewer, (2025)

The density visualization illustrates the density of co-occurring keywords in the academic literature on CBDCs. High-density areas, represented by brighter colors (yellow to green), indicate frequent and central thematic intersections, while low-density regions (blue to dark purple) represent less common or more peripheral topics. At the center of the map, the keywords CBDC, central bank digital currency, central bank, and blockchain exhibit the highest concentration, emphasizing the central role they play in determining the research agenda. Closely surrounding this core are highly relevant terms such as monetary policy, financial stability, digital currencies, and distributed ledger technology, reflecting the dominant focus on macroeconomic impacts and technical infrastructure.

Peripheral keywords like technology acceptance model, DSGE model, PLS-SEM, and tokenization suggest emerging or specialized subfields that, while not yet central to the discourse, indicate growing methodological diversity and interdisciplinary integration. The appearance of region specific terms such as e-CNY, China, and ECB, as well as global financial governance indicators like financial institutions and services, reflects the increasing geopolitical and institutional relevance of CBDCs. Overall, the density distribution reveals a research landscape that is both centered around key economic and technological foundations and expanding toward broader regulatory, behavioral, and geopolitical dimensions.

Table 3. Authors, Articles, and Keywords of the Top Ten Most Cited CBDC Publications

Authors	Publications	Keywords	Citations
Franklin Allen, Xian Gu, Julapa Jagtiani	Fintech, Cryptocurrencies, And CBDC: Financial Structural Transformation in China	Fintech, Cryptocurrency, Regulations, Stablecoins, CBDCs, e-CNY, China	137
Jesus Fernandez-Villaverde, Daniel Sanches, Linda Schilling, Harald Uhlig	Central Bank Digital Currency: Central Banking For All?	Central Bank Digital Currency, Central Banking, Intermediation, Maturity Transformation, Bank Runs, Lender of Last Resort	112
Markus K. Brunnermeier, Dirk Niepelt	On The Equivalence Of Private and Public Money	Money Creation, Monetary System, Inside Money, Outside Money, Equivalence, CBDC, Chicago Plan, Sovereign Money	109
John Barrdear, Michael Kumhof	The Macroeconomics of Central Bank Digital Currencies	Central Bank Digital Currency, Money Creation, Money Demand, Endogenous Money, Banks, Financial Intermediation, Bank Lending, Distributed Ledgers, Blockchain, Countercyclical Policy, Seigniorage	107
Itai Agur, Anil Ari, Giovanni Dell'Ariccia	Designing Central Bank Digital Currencies	CBDC, Fintech, Digital Currency, Financial Intermediation, Network Effects	106
Yizhi Wang, Brian M. Lucey, Samuel A. Vigne, Larisa Yarovaya	The Effects Of Central Bank Digital Currencies News On Financial Markets	CBDC, Uncertainty and Attention Index, Market Effect, SVAR, DCC-GJR-GARCH	100
Zhenghui Li, Cunyi Yang, Zhehao Huang	How Does The Fintech Sector React to Signals From Central Bank Digital Currencies?	Fintech, Central Bank Digital Currency, Capital Market, Impulse Response, TVP-VAR	84
Seyed Mohammadreza Davoodalhosseini	Central Bank Digital Currency and Monetary Policy	Central Bank Digital Currency, Cash, Monetary Policy	79
Massimo Ferrari Minesso, Arnaud Mehl, Livio Stracca	Central Bank Digital Currency in an Open Economy	Central Bank Digital Currency, DSGE Model, Open economy, Optimal Monetary Policy, International Monetary System	68
David Kuo Chuen Lee, Li Yan, Yu Wang	A Global Perspective on Central Bank Digital Currency	Central Bank Digital Currency (CBDC), Digital Currency Electronic Payment (DCEP), Cryptocurrency, Distributed Ledger Technology, Token, Inclusive Finance	68

An examination of the ten most cited academic publications on CBDCs reveals the thematic contours and scholarly priorities shaping this rapidly evolving field. The citation frequencies, alongside the distribution of keywords, illustrate a research landscape that is both conceptually diverse and policy oriented, with substantial attention directed toward financial innovation, monetary policy, and technological transformation.

The articles with the highest citation counts consistently emphasize topics such as fintech, cryptocurrencies, monetary systems, and digital payment infrastructures. High frequency keywords such as Central bank digital currency, digital currency, fintech and monetary policy signal the field's preoccupation with understanding CBDCs as both a monetary innovation and a structural transformation of financial intermediation. Notably, the prominence of terms like e-CNY, Blockchain, and Distributed Ledger Technology indicates a strong technological underpinning in CBDC scholarship, particularly in relation to implementation frameworks and regulatory challenges. In the most cited study, which focuses on the Chinese experience with e-CNY, keywords such as regulations, stablecoins, and cryptocurrency suggest a regional and legal institutional emphasis. In contrast, several other highly cited works adopt a more macroeconomic or theoretical approach, as reflected in recurring terms like money creation, bank lending, seigniorage, and countercyclical policy. These conceptual keywords point to an analytical agenda aimed at rethinking central banking operations and the implementation of monetary policy in the existence of sovereign digital money. Furthermore, keywords such as intermediation, bank runs, and lender of last resort underline the critical discourse around the disintermediating potential of CBDCs and their implications for financial stability. The appearance of modeling terms like SVAR, TVP-VAR, and DSGE indicates the integration of quantitative methods to examine market responses and macroeconomic dynamics, revealing a methodological diversification in the literature. Finally, keywords such as inclusive finance, network effects, and uncertainty index reflect the field's attention to broader socio-economic objectives and behavioral responses to digital currency news and policy signals. Overall, the interplay between keyword frequency and citation volume highlights a maturing research domain that balances technical depth with practical relevance, while contributing to both theoretical understanding and policy formulation regarding CBDCs.

When the table is analyzed from the perspective of the authors, it becomes evident that the most influential contributions in the field of CBDCs have been produced by well established scholars and research teams from diverse institutional and disciplinary backgrounds. The highest cited paper, 137 citations, is authored by Allen F., Gu X., and Jagtiani J. The presence of Allen F., a prominent figure in financial economic, undoubtedly contributes to the paper's academic impact. Similarly, the study by Fernandez-Villaverde J, Sanches D., Schilling L., and Uhlig H., which has received 112 citations, reflects a high level of scholarly rigor. The inclusion of Uhlig H., known for his expertise in macroeconomic modeling, adds further depth to the research.

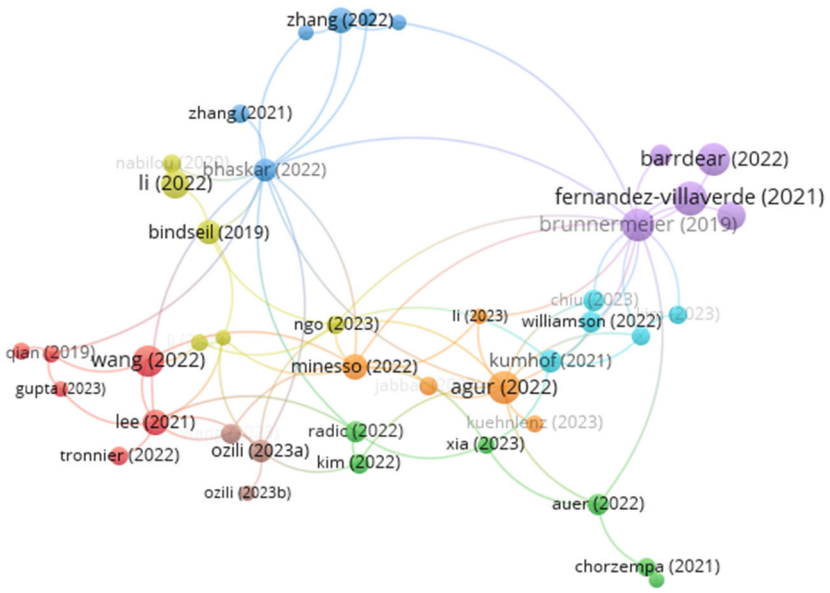
The work of Brunnermeier M.K. and Niepelt D., with 109 citations, provides a theoretical exploration of the equivalence between public and private money, demonstrating the authors' strong foundations in monetary theory. Barrdear J. and Kumhof M.'s paper, cited 107 times, addresses the macroeconomic implications of CBDCs. Kumhof M.'s prior affiliations with the International Monetary Fund (IMF) and the Bank of England enhance the policy relevance of the study.

Another noteworthy contribution is by Agur I., Ari A., and Dell'Ariccia G., which received 106 citations. Dell'Ariccia's association with the IMF underscores the practical and policy-oriented nature of the research, particularly concerning financial intermediation and the design of digital currencies. The collaborative work of Wang Y., Lucey B.M., Vigne S.A., and Yarovaya L., cited 100 times, integrates financial econometrics with CBDC related market responses. Lucey B.M. and Yarovaya L. are particularly recognized for their empirical research on financial market volatility and cryptocurrency.

Li Z., Yang C. and Huang Z., with 84 citations, contribute an important perspective by analyzing the fintech sector's response to CBDC signals, reflecting the increasing intersection of digital innovation and monetary policy. Among the single author contributions, Davoodalhosseini S.M. stands out with 79 citations, indicating that individual scholarship can also yield significant influence. His work focuses on the interaction between CBDCs and monetary policy, offering analytical depth.

Minesso M.F., Mehl A., and Stracca L.'s jointly authored paper, cited 68 times, examines CBDCs in the context of an open economy. Their affiliations with the European Central Bank (ECB) emphasize the institutional and macroeconomic focus of their analysis. Similarly, the work of Lee, D.K.C, Yan L., and Wang Y., also with 68 citations, provides a global perspective on CBDCs, particularly in the context of digital payment systems and financial inclusion, areas in which Lee D.K.C is notably active.

Figure 4. Most Cited Authors' Citation Network



Source: VOSviewer, (2025)

Figure 4 shows the citation network of the most cited authors in this field, generated through bibliometric analysis. The visualization is constructed using VOSviewer, where nodes represent individual authors and edges reflect citation relationships between them. The size of each node is related to the total number of citations it receives, whereas the color coded clusters indicate groups of authors who frequently cite each other, suggesting thematic or intellectual proximity.

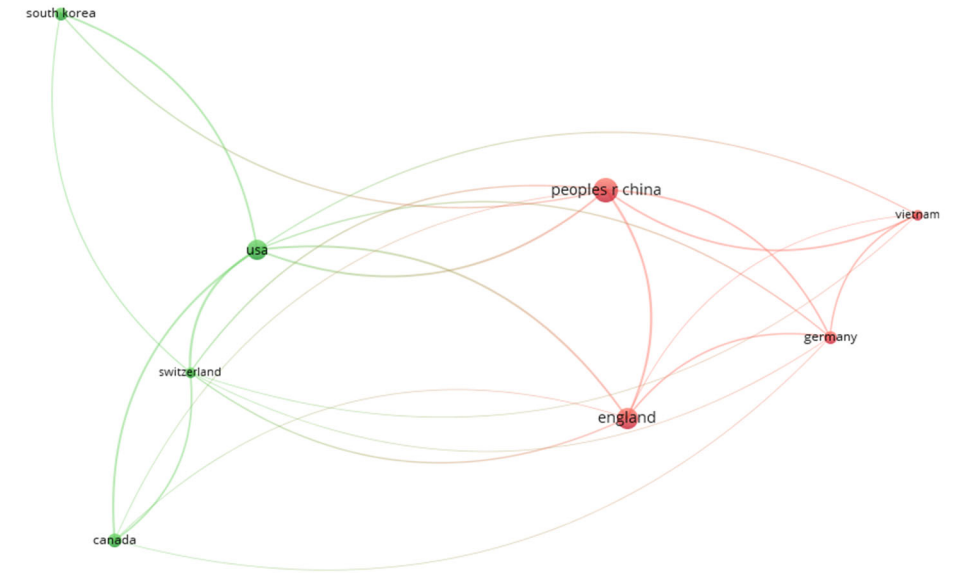
The citation network presented in the figure illustrates the intellectual structure of the most cited authors in the field, with each node representing an author and each link denoting a citation relationship. The size of the nodes reflects the number of citations received, while the color coded clusters indicate thematic groupings based on co-citation patterns. The network reveals five major clusters, suggesting the presence of distinct subfields within the literature. The red cluster, which includes authors such as Wang, Y., seems to focus on economic policy analysis and the socio financial impacts of digital currency systems. The blue cluster, dominated by authors like Zhang T., Bhaskar R., and Nabilou H., appears to represent research streams centered on the technological and systemic architecture of digital financial systems. The green cluster, which includes Auer R., Chorzempa M., and Kim J.J., is more regulatory in orientation, emphasizing the governance and oversight of CBDCs. The purple cluster, with prominent figures such as Brunnermeier M.K., Fernandez-Villaverde J., and Barrdear J., comprises scholars who contribute to macroeconomic modeling and theoretical underpinnings. Finally, the orange cluster, including Agur I., Minesso M.F., and Ngo V.M., appears to function as a thematic bridge, integrating policy analysis with empirical data and interdisciplinary insights.

In terms of impact and centrality, the author Minesso M.F. occupies a key position at the central of the network, demonstrates a high degree of intermediary centralization. This suggests that Minesso's work plays an important role in establishing connections different research strands and serves as a foundational reference across various subfields. Other influential authors, such as Agur I. and Ozili P.K., also connect multiple clusters, reflecting their interdisciplinary contributions and citation impact. The dense citation paths around these authors point to their important role in shaping the scholarly dialogue across both theoretical and policy oriented domains.

The overall network density suggests a moderately cohesive research field, with robust internal links within clusters and a sufficient number of inter-cluster connections to indicate intellectual integration. While clusters like the red and blue groups exhibit tight internal cohesion, the presence of cross-cluster citation links, especially those involving central authors, demonstrates a healthy exchange of ideas. Some peripheral authors, however, show weaker connections, which may point to emerging areas of research or specialized contributions not yet fully assimilated into the mainstream literature.

The citation network analysis uncovers a well defined yet interconnected academic landscape, structured around five thematic clusters. The presence of influential bridging authors and the moderate level of cross citation suggest an evolving field characterized by both specialization and interdisciplinary dialogue. This structure supports the development of cumulative knowledge while allowing for the integration of diverse theoretical and methodological approaches, ultimately contributing to the the depth and scope of the research field.

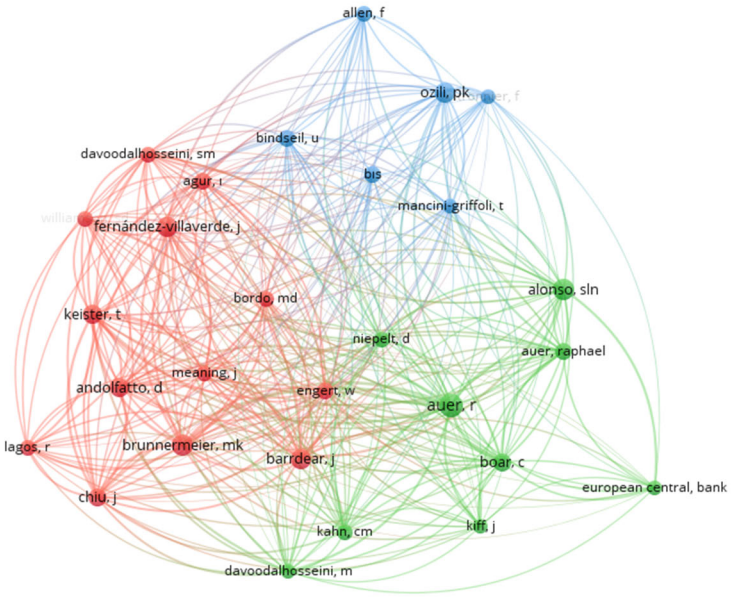
Figure 5. Citation Network of Countries with the Most Citations



Source: VOSviewer, (2025)

The figure 5 illustrates a country level citation network, constructed by including only countries that have contributed a minimum of three publications, resulting in a total of eight countries meeting this threshold. The network reveals two prominent clusters of countries, differentiated by color and density. One cluster, centered around the United States, includes Canada, Switzerland, and South Korea, while the other cluster is organized around the China and comprises Germany, England, and Vietnam. The United States and China appear as central nodes within the network, indicating their dominant role in the citation landscape. The density and directionality of the links suggest strong bilateral citation relationships, especially among the United States and China, and among China, England, and Germany. The network structure highlights the pivotal role of these two countries in bridging transnational scholarly exchanges. The visualization underscores the existence of regionally concentrated citation patterns, while also emphasizing the global influence of key academic actors like the United States and China in shaping the international research dialogue.

Figure 6. Co-citation Network of Cited Authors



Source: VOSviewer, (2025)

The figure 6 presents a co-citation network of cited authors generated using VOSviewer, where each node represents a cited author and edges show how often two authors are cited together. A minimum threshold of ten citations was applied to enhance the analytical clarity and focus on influential contributors within the field. The network reveals a clear clustering structure, with three prominent groups denoted by distinct colors, indicating thematic or intellectual proximity among the authors.

The red cluster comprises scholars such as Fernández-Villaverde J., Keister T., and Brunnermeier M.K., who appear to be central figures within a macroeconomic or financial stability oriented research tradition. These authors are frequently cited together, suggesting a shared conceptual or methodological framework. The green cluster includes notable figures such as Auer R., Alonso S.L.N., and affiliations like the European Central Bank, reflecting a strong institutional and policy focused orientation, possibly in the context of digital currencies, payment systems, or monetary policy. The blue cluster, featuring authors like Allen F., Ozili P.K., and Bindseil U., appears to be more aligned with financial technology, regulatory structures, or CBDC implementation perspectives, given the institutional affiliations and policy related research emphasis of these authors.

The structure of the network reflects the interdisciplinary and collaborative nature of the research field, showing a high degree of interconnection among key authors. The density and proximity of the nodes between and within clusters suggest strong thematic coherence and frequent co-citation patterns, indicative of an evolving yet cohesive body of literature.

5. Conclusion and Discussion

With the impact of technological developments, digitizing financial markets began to be reevaluated, especially after the 2008 global financial crisis, and interest in digital financial instruments increased significantly during this period. In the post crisis period, the acceleration of digitalization paved the way for the emergence and rapid proliferation of digital currencies, laying the groundwork for profound transformations in the financial system.This transformation accelerated even further in 2020 with the COVID-19 pandemic; the need to limit physical contact, the decline in cash usage, and the growing demand for digital solutions led to significant structural changes in financial markets. Digital payment systems and digital currencies came to the forefront during this period, and with the influence of globalization, financial structures began to reshape. In parallel with all these developments, central banks around the world are continuing their research and pilot applications related to CBDCs. However, there have been serious criticisms of CBDCs in recent years. Some central banks are slowing down their

work or shifting their focus from retail transactions to wholesale transactions. Despite this, CBDCs have increasingly begun to occupy a central position in the global financial architecture of the present day, due to their potential to both support financial stability and adapt to the requirements of the digital age. Therefore, CBDCs were selected as the research subject of this study, and it was deemed necessary to evaluate the current state of academic research in this domain.

The main objective of this study is to conduct a bibliometric analysis of the 343 most cited publications on CDBCs in the Web of Science database between 2018 and 2024, thereby providing a systematic contribution to the existing literature in the field of finance. Within this context, the study intends to highlight the current research topics, conceptual trends, and key themes in the field, while also identifying potential gaps in the literature to guide future research. Accordingly, a comprehensive analysis was conducted based on specific research questions focusing on authors, publications, publication years, types and countries, keywords, citation relationships, and major topics.

The analysis results show that the total number of publications on CBDCs has increased significantly since 2021, indicating the increasing interest in this area. Number of publications increased from 1 in 2018 to 107 in 2024, with 31.2% of the total published in the latter year. Of all publications, 77.4% are journal articles, and 13.7% are proceeding papers. Regarding indexing, 45% of the articles are indexed in the SSCI, 28.3% in the ESCI, and 3.9% are review articles. Based on countries,11% of the publications originate from China, followed by the USA (8.9%), the UK (8.7%), Germany (6%), South Korea (4.3%), and Russia (4%). In terms of language, 96.2% of the publications are in English. According to the distribution of publications across the top 10 Web of Science categories, the most prominent fields are Economics and Business Finance and Computer Science. At a micro level, 67.4% of the topics are related to blockchain and 10.5% to monetary policy. Additionally, 1,467 articles have cited the 343 analyzed publications. Among these citations, 36.2% relate to blockchain, 11.3% to market dependencies, 6.8% to the finance-growth nexus, and 5.8% to monetary policy. The total number of citations is 4,012, with an average of 11.7 citations per publication. 2024 was the year with the most citations, with 1,642.

In order to gain a better understanding of the conceptual structure of academic literature, a keyword co-occurrence analysis was performed using VOSviewer software, revealing 2,028 co-occurrences, 1,298 links, and 17 distinct clusters. The dominant thematic focus in the literature includes Central Bank Digital Currency, CBDC, and related terms. The most strongly associated keywords include blockchain, cryptocurrencies, online banking, digital payments, digital assets, digital currency, fintech, financial inclusion, security, central bank, monetary policy, financial stability, cash, financial regulation, data privacy, and network security. The frequency of these terms highlights the dual nature of CBDCs as both a monetary instrument and a digital innovation. Moreover, the integration of terminology from computer science demonstrates that CBDCs are increasingly embedded within interdisciplinary frameworks involving information technology, data management, and cybersecurity. The emergence of 17 thematic clusters indicates a rich and multidimensional research landscape. The network structure reflects insights drawn from diverse disciplines such as economics, computer science, law, and behavioral sciences, emphasizing the interdisciplinary nature of CBDC research. These thematic groupings show the evolution of the field from a narrowly focused domain to a broader and more integrated research agenda, fostering cross disciplinary interaction.

The visualization of keyword relationships over time reveals a shift in academic interest from core concepts such as digital currency, central bank, financial stability, and digitalization to more technical and policy-oriented topics like distributed ledger technology, cryptocurrencies, financial inclusion, and regulatory frameworks. In the last few years, the focus has further expanded to emerging concerns such as privacy, scalability, machine learning, and user adoption. This progression reflects the growing interest of central banks and policymakers in the subject. Emerging keywords such as digital rupee, privacy concerns, and content analysis indicate not only methodological diversity but also the geographical expansion of CBDC initiatives, especially in emerging and developing economies.

Based on density visualization analysis, the terms central bank digital currency, CBDC, blockchain, and central bank are the highest point in the center of the map intensity, indicating that the literature primarily revolves around these concepts. Surrounding this core are terms such as monetary policy, financial

stability, digital currencies, and distributed ledger technology, reflecting a focus on macroeconomic impacts and technical infrastructure. In the outer rings, methodological and applied keywords such as the technology acceptance model, DSGE model, PLS-SEM, and tokenization appear, demonstrating theoretical diversity in the field. The prominence of regional terms like E-CNY, China, and ECB, along with global financial governance concepts such as financial institutions and services, also highlights the growing geopolitical and institutional significance of CBDCs. Overall, the keyword density distribution shows that the research field encompasses not only economic and technological foundations but also extends to regulatory, behavioral, and geopolitical dimensions. The interaction between keyword frequency and citation volume underscores the emergence of a mature research area that balances technical depth with practical relevance, contributing to both theoretical understanding and policy development related to CBDCs.

The citation network formed among the most cited authors represents the intellectual structure of the area. The overall network density shows strong internal connections within clusters and sufficient inter-cluster relationships, suggesting a moderately cohesive and integrated research field. The tight internal cohesion observed in certain clusters, and the presence of inter cluster citation links through central authors, point to a healthy intellectual exchange. However, some peripheral authors exhibit weaker connections, indicating emerging subfields or novel expertise not yet fully integrated into the mainstream literature. The citation network analysis reveals a structured academic environment built around five thematic clusters, with clearly defined yet interconnected boundaries. The presence of influential bridging authors and moderate cross citation patterns suggests a dynamic and evolving field characterized by both specialization and interdisciplinary dialogue. This structure supports the accumulation of knowledge through the integration of diverse theoretical and methodological approaches and contributes significantly to the field's maturation process.

The co-citation network among countries with at least three publications highlights eight countries and two prominent regional clusters. The first cluster, centered around the United States, includes Canada, Switzerland, and South Korea, while the second cluster, centered around China, includes Germany, the United Kingdom, and Vietnam. The intensity and directionality of the links reveal strong bilateral citation relationships, especially between the United States and China, as well as among China and both the United Kingdom and Germany. This network structure emphasizes the pivotal role and global influence of the United States and China in bridging transnational academic exchanges.

The co-citation network among authors with at least ten citations exhibits a clearly clustered structure around three main groups. The network structure reflects the interdisciplinary and collaborative nature of the field of research, with high levels of connectivity among key authors. The density and proximity of nodes within and between clusters indicate frequently repeated co-citation patterns and strong thematic consistency. This suggests that although the field is still developing, it is increasingly converging toward a more coherent and integrated body of literature.

The findings of this study show that, particularly after 2021, there has been a significant rise in academic interest in CBDCs, especially in countries such as the United States, China, and across the Europe. Keyword co-occurrence and density analyses reveal that CBDCs are not only a monetary innovation but also represent a multidisciplinary research domain intersecting with blockchain, cybersecurity, financial inclusion, data privacy, and regulatory frameworks. Citation, author, and country network analyses highlight an increasingly integrated intellectual structure, growing international collaborations, and a deepening of research globally. In this respect, the study emphasizes the need to address CBDCs within a broader technological, financial, and geopolitical framework, while also shedding light on thematic trends, conceptual gaps, and core issues in the literature. These findings are not only of interest to the academic literature, but also to central banks, policymakers, market regulators, and all relevant stakeholders by providing a strategic perspective on the rise of digital currencies.

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Araştırma Makalesi

A Bibliometric Analysis of Central Bank Digital Currencies (CBDCs)

Merkez Bankası Dijital Paraları (CBDC) Üzerine Bibliyometrik Bir Analiz

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Genişletilmiş özet

2008 küresel finansal krizinin ardından teknolojik gelişmelerin etkisiyle finansal piyasaların dijitalleşmesi yeniden gündeme gelmiş ve dijital finansal araçlara yönelik ilgi önemli ölçüde artmıştır. Kriz sonrası dönemde dijitalleşmenin hız kazanması, dijital para birimlerinin ortaya çıkmasına ve hızla yayılmasına zemin hazırlamış, bu gelişmeler finansal sistemde köklü dönüşümlerin başlangıcı olmuştur. Bu dönüşüm, 2020 yılında COVID-19 pandemisinin etkisiyle daha da ivmelenmiştir. Bu süreçte dijital ödeme sistemleri ve dijital para birimleri ön plana çıkmış, küreselleşmenin etkisiyle finansal yapılar yeniden şekillenmeye başlamıştır. Tüm bu gelişmelerle paralel olarak, dünya genelindeki merkez bankaları Merkez Bankası Dijital Paraları(CBDC) üzerine yürüttükleri araştırmaları ve pilot uygulamaları yoğunlaştırmış, bu alandaki akademik çalışmalar stratejik bir önem kazanmıştır. Bu nedenle, bu çalışma kapsamında CBDC'ler araştırma konusu olarak seçilmiş ve bu alandaki akademik literatürün mevcut durumunun kapsamlı şekilde değerlendirilmesi gerekliliği ortaya konmuştur.

Bu çalışmanın temel amacı, Web of Science(WoS) veri tabanında 2018–2024 yılları arasında yayımlanmış olan ve en çok atıf alan 343 yayına dayanarak bir bibliyometrik analiz gerçekleştirmektir. Böylece mevcut literatüre sistematik bir katkı sunulması ve bu gelişen alanın akademik haritasının çıkarılması hedeflenmiştir. Bu bağlamda çalışma, alandaki güncel araştırma konularını, kavramsal eğilimleri ve temel temaları belirlemeyi; aynı zamanda gelecek araştırmalara yön verebilecek olası boşlukları ortaya koymayı amaçlamaktadır. Analiz, belirli araştırma sorularına dayalı olarak yazarlar, yayınlar, yayın yılları, yayın türleri ve ülkeleri, anahtar kelimeler, atıf ilişkileri ve öne çıkan konular çerçevesinde gerçekleştirilmiştir.

CBDC üzerine yapılan yayınların 2021 yılından itibaren önemli ölçüde arttığı görülmektedir. Yayın sayısı 2018 yılında yalnızca 1 iken, 2024 yılında 107'ye ulaşmış ve toplam yayınların %31,2'si bu yılda yayımlanmıştır. Tüm yayınların %77,4'ü akademik dergi makalesi, %13,7'si konferans bildirisi ve %3,9'u derleme makalelerden oluşmaktadır. İndeks dağılımı incelendiğinde, yayınların %45'i SSCI, %28,3'ü ESCI kapsamında yer almakta ve %96,2'si İngilizce yazılmıştır. Ülke bazlı dağılımda ise yayınların %11'i Çin kaynaklıdır. Bu ülkeyi %8,9 ile ABD, %8,7 ile İngiltere, %6 ile Almanya, %4,3 ile Güney Kore ve %4 ile Rusya takip etmektedir. Yayınların en yoğun şekilde yer aldığı WoS kategorileri arasında ekonomi, işletme-finans ve bilgisayar bilimleri öne çıkmaktadır. Mikro düzeyde değerlendirildiğinde ise, konuların %67,4'ü blokzincir ile, %10,5'i ise para politikası ile doğrudan ilişkilidir. Ayrıca, analiz edilen 343 yayına toplamda 1.467 farklı yayın tarafından atıfta bulunulmuştur. Bu atıfların %36,2'si blokzincir, %11,3'ü piyasa bağımlılıkları, %6,8'i finansal büyüme ilişkisi ve %5,8'i para politikası ile ilgilidir. Toplam atıf sayısı 4.012 olup, yayın başına ortalama atıf sayısı 11,7'dir. En fazla atıfın yapıldığı yıl ise 1.642 atıf ile 2024 olmuştur.

Literatürün kavramsal yapısını daha iyi anlayabilmek adına VOSviewer yazılımı aracılığıyla anahtar kelime eş görünüm analizi gerçekleştirilmiştir. Bu analizde toplamda 2.028 eş görünüm, 1.298 bağlantı

ve 17 farklı küme belirlenmiştir. Literatürde baskın tematik odak noktası Merkez Bankası Dijital Parası, CBDC ve ilgili terimler etrafında şekillenmektedir. En güçlü şekilde ilişkilendirilen anahtar kelimeler arasında blokzincir, kripto paralar, çevrim içi bankacılık, dijital ödemeler, dijital varlıklar, fintech, finansal kapsayıcılık, güvenlik, merkez bankası, para politikası, finansal istikrar, nakit, finansal düzenleme, veri gizliliği ve ağ güvenliği yer almaktadır. Bu terimlerin yüksek sıklığı, CBDC'lerin hem parasal bir araç hem de dijital bir inovasyon olarak çift yönlü bir yapıya sahip olduğunu göstermektedir. Ayrıca bilgisayar bilimi kökenli terimlerin entegrasyonu, CBDC araştırmalarının bilgi teknolojisi, veri yönetimi ve siber güvenlik gibi alanlarla bütünleşik hale geldiğini ortaya koymaktadır. 17 tematik kümenin ortaya çıkması, araştırma alanının zengin ve çok boyutlu bir yapıya sahip olduğunu göstermektedir. Literatür ağı, ekonomi, bilgisayar bilimleri, hukuk ve davranış bilimleri gibi farklı disiplinlerden elde edilen kavrayışların birleştiği bir yapıdadır. Bu durum, CBDC araştırmalarının disiplinler arası niteliğini vurgulamakta; dar bir teknik perspektiften daha geniş, bütüncül ve etkileşimli bir araştırma gündemine doğru evrildiğini göstermektedir.

Zamansal olarak anahtar kelimeler arasındaki ilişkilerin görselleştirilmesi, akademik ilginin dijital para, merkez bankası, finansal istikrar ve dijitalleşme gibi temel kavramlardan dağıtık defter teknolojisi, kripto paralar, finansal kapsayıcılık ve düzenleyici çerçeveler gibi daha teknik ve politika odaklı konulara kaydığını ortaya koymaktadır. Son yıllarda ise odak, gizlilik, ölçeklenebilirlik, makine öğrenimi ve kullanıcı adaptasyonu gibi yeni konulara yönelmiştir. Bu gelişim, merkez bankaları ve politika yapıcıların konuya olan ilgisinin derinleştiğini yansıtmaktadır. Dijital rupi, gizlilik endişeleri ve içerik analizi gibi yeni anahtar kelimeler, sadece yöntemsel çeşitliliğe değil, aynı zamanda CBDC girişimlerinin coğrafi olarak da genişlediğine, özellikle gelişmekte olan ekonomilere yayıldığına işaret etmektedir.

Yoğunluk analizine göre central bank digital currency, CBDC, blockchain ve central bank terimleri haritanın merkezinde ve en yoğun noktalarında yer almaktadır. Bu merkez etrafında para politikası, finansal istikrar, dijital para birimleri ve dağıtık defter teknolojisi gibi kavramlar yer almakta, bu da makroekonomik etkiler ve teknik altyapıya yönelik bir odaklanmayı yansıtmaktadır. Haritanın dış halkalarında ise teknoloji kabul modeli, DSGE modeli, PLS-SEM ve tokenizasyon gibi teorik ve uygulamalı anahtar kelimeler yer almaktadır. Bu durum, alandaki yöntemsel çeşitliliği göstermektedir. Bölgesel kavramlar arasında E-CNY, Çin ve ECB gibi ifadeler dikkat çekerken; finansal kurumlar ve hizmetler gibi küresel yönetişim terimlerinin öne çıkması CBDC'lerin artan jeopolitik ve kurumsal önemini ortaya koymaktadır. Genel olarak anahtar kelime yoğunluk dağılımı, bu araştırma alanının yalnızca ekonomik ve teknolojik temellere değil; aynı zamanda düzenleyici, davranışsal ve jeopolitik boyutlara da uzandığını göstermektedir. Anahtar kelime sıklığı ile atıf hacmi arasındaki etkileşim, teknik derinlik ile pratik önem arasında bir denge kuran olgunlaşmış bir araştırma alanının ortaya çıktığını göstermektedir.

Yazarlar arasında oluşan atıf ağı, alandaki entelektüel yapıyı temsil etmektedir. Genel ağ yoğunluğu, kümeler içinde güçlü bağlantıların ve kümeler arasında yeterli düzeyde ilişkinin bulunduğunu, dolayısıyla orta derecede bütünleşmiş ve uyumlu bir araştırma alanı oluştuğunu göstermektedir. Belirli kümelerde sıkı içsel bütünleşme gözlenirken, merkezi yazarlar aracılığıyla kümeler arası atıf bağlantılarının varlığı sağlıklı bir entelektüel etkileşime işaret etmektedir. Bununla birlikte, çevrede kalan bazı yazarların daha zayıf bağlantılara sahip olması, henüz ana literatüre tam entegre olmamış yeni alt alanların veya uzmanlıkların gelişmekte olduğunu göstermektedir. Atıf ağı analizi, beş ana tematik küme etrafında yapılandırılmış bir akademik ortam ortaya koymakta; her biri kendi içinde belirgin ancak birbirine bağlı alanlardan oluşmaktadır. Köprü yazarların varlığı ve orta düzeydeki karşılıklı atıf örüntüleri hem uzmanlaşmayı hem de disiplinler arası diyaloğu bir arada barındıran dinamik bir araştırma alanının varlığına işaret etmektedir.

Ülkeler arasında kurulan eş-atıf ağı, sekiz ülkeyi ve iki bölgesel kümeyi öne çıkarmaktadır. ABD merkezli ilk kümeye Kanada, İsviçre ve Güney Kore dahil olurken; Çin merkezli ikinci kümeye Almanya, Birleşik Krallık ve Vietnam dahildir. Ağ bağlantılarının yoğunluğu ve yönü, özellikle ABD ve Çin arasında güçlü ikili atıf ilişkileri olduğunu göstermekte; Çin'in aynı zamanda Birleşik Krallık ve Almanya ile de sıkı akademik ilişkiler kurduğunu ortaya koymaktadır. Bu yapı, ABD ve Çin'in küresel akademik etkileşimdeki belirleyici rolünü vurgulamaktadır.

Yazarlar arasında oluşturulan eş-atıf ağı ise üç ana grup etrafında kümelenmiş net bir yapıya sahiptir. Bu yapı, araştırma alanının iş birlikçi ve disiplinler arası doğasını yansıtmaktadır. Küme içi ve kümeler arası düğümlerin yakınlığı, sık tekrar eden eş-atıf örüntülerine ve tematik uyuma işaret etmektedir. Bu durum, alanın henüz gelişmekte olmasına rağmen giderek daha bütünleşik ve tutarlı bir literatüre evrildiğini göstermektedir.

Sonuç olarak, çalışmanın bulguları, 2021 sonrası dönemde CBDC'lere yönelik akademik ilgide önemli bir artış olduğunu ve bu artışın özellikle ABD, Çin ve Avrupa ülkelerinde yoğunlaştığını ortaya koymaktadır. Anahtar kelime analizleri, CBDC'lerin yalnızca parasal bir yenilik değil; aynı zamanda blokzincir, siber güvenlik, finansal kapsayıcılık, veri gizliliği ve düzenleyici çerçevelerle kesişen çok disiplinli bir araştırma alanı olduğunu göstermektedir. Atıf ve ağ analizleri, entelektüel yapının bütünleştiğini, uluslararası iş birliklerinin arttığını ve küresel ölçekte araştırma derinliğinin genişlediğini ortaya koymaktadır. Bu bağlamda çalışma, CBDC'lerin teknolojik, finansal ve jeopolitik boyutlarıyla birlikte ele alınması gerektiğine işaret etmekte; literatürdeki tematik eğilimleri, kavramsal boşlukları ve temel sorunları görünür kılarak yalnızca akademiye değil, merkez bankaları, politika yapıcılar ve düzenleyicilere de stratejik bir bakış açısı sunmayı amaçlamaktadır.